

HISTORY
OF THE UNIVERSITY OF MISSOURI
SCHOOL OF MINES
AND METALLURGY

1871-1946

CLARENCE N. ROBERTS

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HISTORY

OF THE UNIVERSITY OF MISSOURI

SCHOOL OF MINES AND METALLURGY

1871-1946

CLARENCE N. ROBERTS
Instructor in History

To those who have made the School
of Mines and Metallurgy a distinguished
institution this book is sincerely dedicated.

FOREWORD

The writing of the history of an educational institution is an extremely interesting, enlightening, and broadening experience. This is especially true of the history of Missouri School of Mines and Metallurgy, which has a past so enriched by a glorious record of scholarship and achievements.

Perhaps the best source for the history of the School of Mines is the annual school catalog. Fortunately, all but a few are available, and those not accessible are contained in the annual reports of the University of Missouri. The minutes of the faculty proceedings are available for the second school year until 1903; from 1903 until 1920 no record of the faculty proceedings apparently has been preserved, but, beginning in 1920 until the present time a very complete record of faculty meetings exists. Since 1907, the *ROLLAMO*, the official school annual, contains valuable information on athletic surveys, and other student activities. The *MISSOURI MINER*, the student newspaper, is indispensable for the period since 1915. The local newspaper, the *ROLLA HERALD*, is particularly of service for the early history of the school. The *ROLLA DAILY NEWS*, formerly the *NEW ERA*, is important for the recent period. Reports of Visiting Committees and of the Board of Curators give limited information. The Journals of the Proceedings of the Missouri General Assembly are valuable for legislative debates especially for the founding period. A manuscript history of the University of Missouri, by William F. Switzler, gives a very accurate account of meetings of the Board of Curators prior to 1903.

Two histories of Missouri School of Mines and Metallurgy have been published. One of these is a brief history by Professor Samuel Horace Lloyd, Jr., which is contained as a chapter in the Centennial History of the University by Dr. Jonas Viles. The other history is a very detailed account published by the Phelps County Historical Society.

I wish to take this opportunity to express my thanks and appreciation to the following members of the 75th Anniversary Committee, who have read the manuscript and have contributed constructive criticism: Dr. Walter T. Schrenk, Chairman; Dr. Paul G. Herold; Frank E. Dennie; I. Herrick Lovett; Herbert R. Hanley, Professor Emeritus; Joe B. Butler; Rex Z. Williams; Dr. Aaron J. Miles; William J. Jensen; and Samuel H. Lloyd, Jr. I am deeply indebted to the History Committee composed of Professors O. A. Henning, F. E. Dennie, S. H. Lloyd, and M. H. Cagg.

Special thanks are due to Professor M. H. Cagg, who read the manuscript and made valuable recommendations; to Noel Hubbard, Registrar, who furnished data on enrollments and degrees granted, which are included in the tables in this book; to William J. Young, Director of Publications of the University of Missouri, the writer is indebted for the efficient manner in which he conducted the problems connected with the publishing of this book; to Earl J. Randolph, Librarian of the School of Mines, who cooperated in the collection of source material for the history of the school; and to my former teacher and devoted friend, Thomas A. Brady, Vice-President of the University of Missouri, I am particularly grateful for appropriate suggestions and effective criticisms.

To many others I am also indebted for their contributions in making this historical survey possible.

The writing of this historical review of Missouri School of Mines and Metallurgy, for the celebration of the 75th Anniversary serves to bring to the people of the State of Missouri the story of the struggle for existence and the noble achievements of the past of this their educational institution. May these endeavors of the past inspire future generations to carry on the traditions so established by the University of Missouri School of Mines and Metallurgy.

C. N. ROBERTS

Rolla, Missouri
August 27, 1946

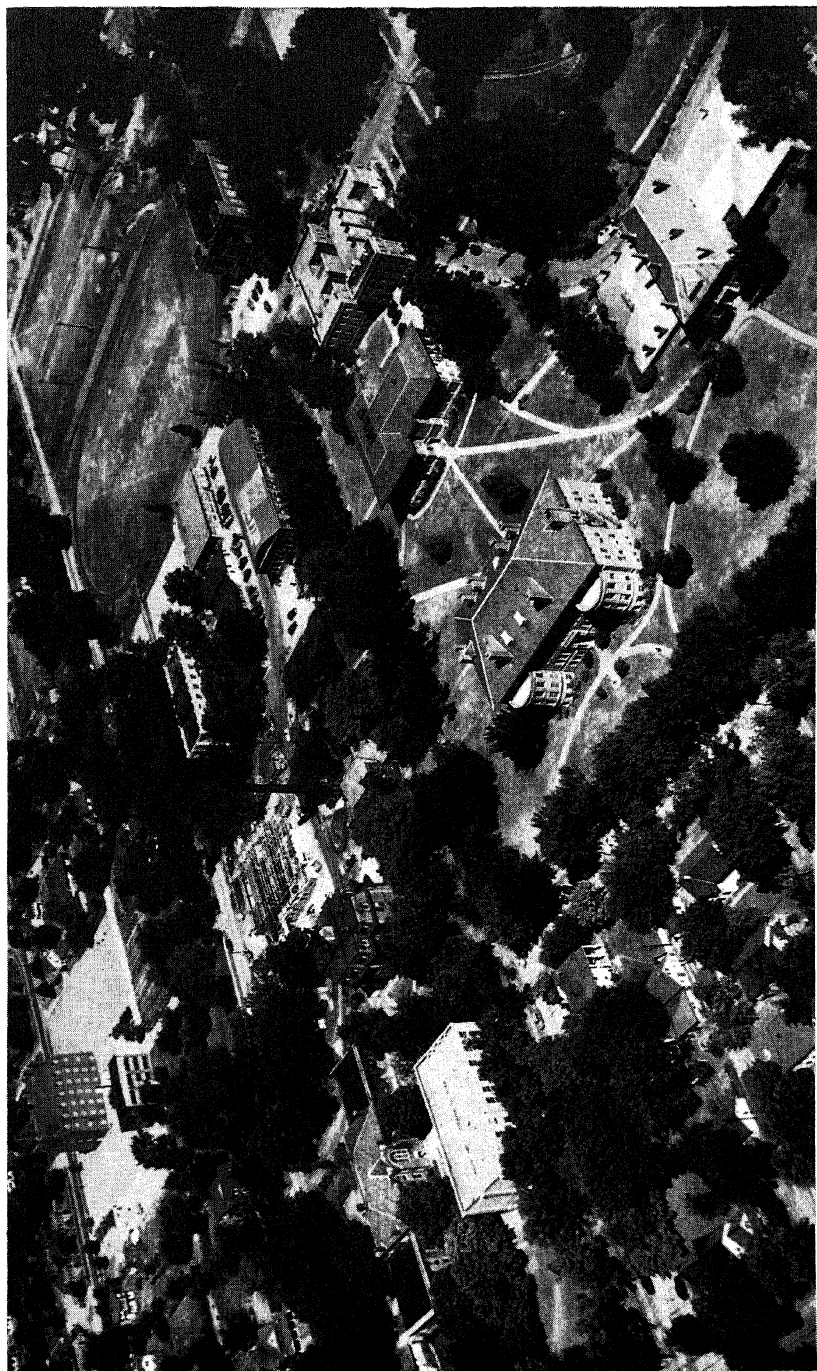
CONTENTS

Page

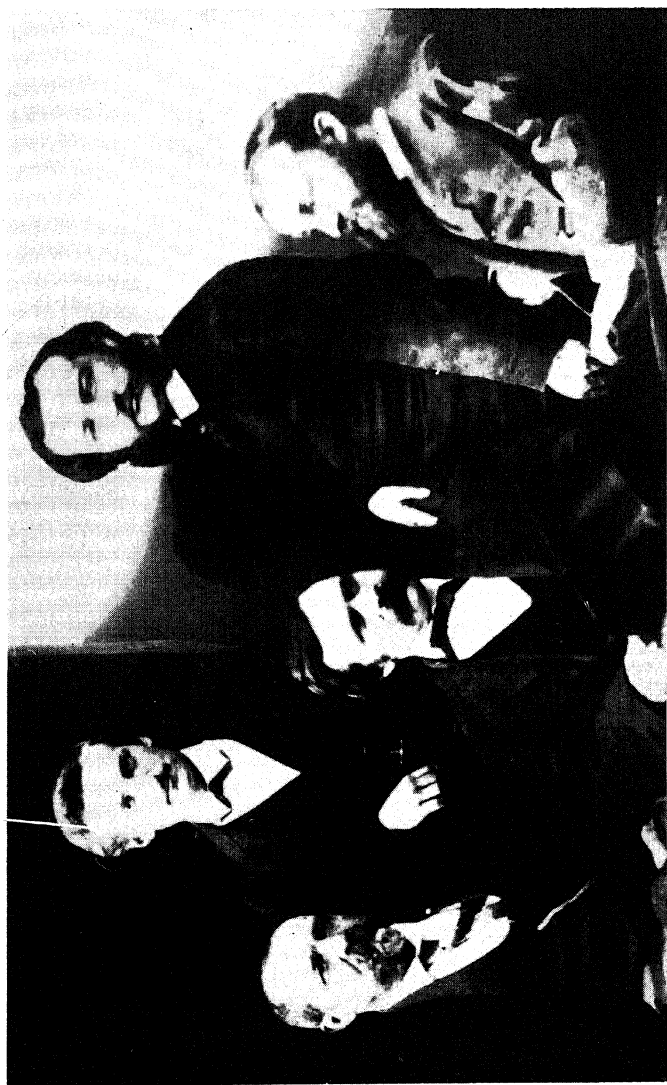
I. Founding the School	9
II. The First Director, Charles P. Williams, 1871-1877	21
III. Eleven Difficult Years, 1877-1888	35
IV. Development of Modern School of Mines and Metallurgy, 1888-1907	43
V. Period of Continued Growth and Service, 1907-1920	59
VI. Era of Curricular Expansion and Broadened Training, 1920- 1941	77
VII. Dean Curtis Laws Wilson and the Present Missouri School of Mines, 1941-1946	103
Retrospect	120

ILLUSTRATIONS

Frontispiece, Aerial View of school campus	Facing Page 8
The First Faculty	Between Pages 8 and 9
The First Graduates	Facing Page 9
Rolla Building	Facing Page 24
Old Chemistry Building	Between Pages 24 and 25
Norwood Hall	Between Pages 24 and 25
Metallurgy and Ore Dressing Building	Facing Page 25
Experiment Station Building	Facing Page 56
Mining Engineering Building	Between Pages 56 and 57
Harris Hall	Between Pages 56 and 57
New Chemistry Building	Facing Page 57
Jackling Gymnasium	Facing Page 64
Parker Hall	Facing Page 65
Charles Herman Fulton	Facing Page 80
Campus View	Facing Page 81
Dr. Allen P. Green	Facing Page 88
Dr. Daniel C. Jackling	Preceeding Page 89
President Frederick A. Middlebush	Facing Page 104
Dean Curtis Laws Wilson	Between Pages 104 and 105
The Present Board of Curators	Facing Page 105

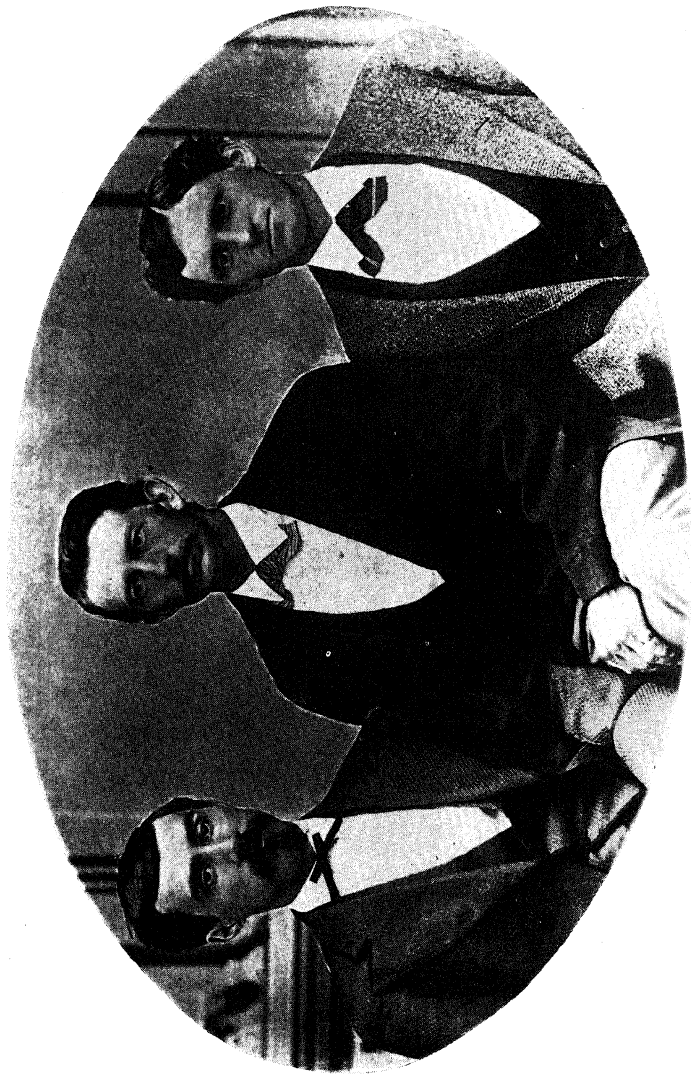


AERIAL VIEW OF CAMPUS



FACULTY DURING FIRST SCHOOL ADMINISTRATION

Reading from left to right: JAMES W. ABERT, NELSON W. ALLEN, CHARLES P. WILLIAMS, DIRECTOR, V. C. YANTIS, AND R. W. DOUTHAT.



THE FIRST GRADUATES OF THE SCHOOL.

GUSTAVUS A. DUNCAN, JOHN HOLT GILL, AND JOHN WALLAE PACK

CHAPTER I

FOUNDING THE SCHOOL

The study of engineering has rooted itself and has demonstrated its significance and permanent value as a phase of higher education in the United States. With the growing complexities of modern scientific developments, engineering education has become one of the most essential programs of study on the American collegiate level. In this industrial and scientific age, engineering education must furnish the trained personnel and leaders demanded in such a technical world. As in the past, the engineer must ever be alert and informed on the numerous scientific developments, and especially on their application for the benefit of mankind. It offers hope to the coming generations that the principles and discoveries of science will be utilized for the material well-being and social progress of the human race.

A review of the seventy-five years of progress of Missouri School of Mines and Metallurgy discloses the success attained by this institution as an agency of public enlightenment and as a means of developing and increasing the mineral wealth of Earth. It is a record of eminent achievement in training men for the practical applications of engineering—thereby elevating the standard of living of all classes. With constancy of purpose and with zeal throughout the past years, this school has made definite contributions to the nation and to the entire world, as well as to the State of Missouri. There can be no doubt that this contribution might be even greater in the future if there could be a more widespread appreciation of the expended efforts of men and women who have been associated with the School of Mines in the past.

Many aspects had to be considered before the founding of Missouri School of Mines. Several years were devoted to the formulation of concrete plans for the establishment of such land grant schools. Many difficult problems and controversial issues had to be settled before the founding of a school of mines could be accomplished.

It was Schoolcraft, in his early observations of the potential mineral wealth of Missouri, who noted the lack of skill and the need for personnel trained in the scientific phases of mining. He found the mining technics far behind those of the Europeans in that day, where, as he observed, "the recent discoveries in mechanics, chemistry, and philosophy" were practiced. In an account of his travels published as early as 1819, he perceived the need for "a mineralogical school located in the mine country where students might be instructed in that useful

science." He pointed out the need for that type of education expressly for those who do not wish, or cannot obtain, the advantages of a liberal education. He noted a lack of both capital and skill, particularly in the lead mines of Missouri, but with the latter deficiency removed by education it was believed that more capital would be invested in Missouri mines.

The period from 1830 to 1860, in Missouri history, was notable for the advancements made in the development of a public school system and in the establishment of the state university at Columbia. However, public sentiment was not solidly crystalized in favor of higher education. The University of Missouri, established by the Geyer Act of 1839, suffered in its early history from both lack of interest on the part of the people of Missouri and lack of support from the state legislature. Although preliminary acts were passed by the General Assembly for the establishment of a public school system in 1835, 1837, and 1839, Missouri did not fully succeed in initiating a public school system until the act of 1853. During this thirty year period, the demands for a school of mines came largely in petitions or memorials to the state legislature, proceedings of certain organizations and societies, and from governors' messages.

Perhaps the most definite action by the state of Missouri, previous to the passage of the Morrill Act, was the action taken by the Missouri General Assembly in 1849. This action was taken in the form of a joint resolution presenting a memorial to the United States Congress for a School of Mines, Metallurgy, Agriculture, and Chemistry. It sought lands from the public domain for such an institution, and said school was not merely to train specialists for the mineral industries of Missouri, but in addition scientists to aid in western explorations and in locating mineral deposits in the new territories of the West. Congress failed to act on this proposition largely because so many such demands were being made from the various states and territories at that time. Also many groups in Congress opposed the granting of public lands by the Federal Government for such a revolutionary development in higher education. Certain other projects were considered more important in 1850, such as the building of transcontinental railroads. However, by 1860 the demands for a new type of education were becoming irresistible.

The industrial revolution, with its array of manufacturing industries, inventions, railroad expansion, and construction projects, was calling loudly for a new type of trained technician. The colleges of the day were inadequately equipped both materially and philosophically to train such leaders. There was a demand for a practical type of education not to exclude the liberal studies, but one in which a skill

would be united with the higher elements of study. It was also agreed that the new type of college would be open to the sons and daughters of the average citizen. It would then be possible for the poor man to send his sons and daughters to receive a new kind of college education. Here the emphasis would be in training for a skill in mechanical arts or in agriculture rather than in Latin, Greek, or other classical studies.

Among the many forces operating to bring about the new type of higher education, two forces appear to be outstanding. First there was the urgent need for men trained in the physical sciences in order to fit into the new industrial America. The thirty year period, prior to 1860, had witnessed such material inventions and discoveries as the reaper, the telegraph, vulcanization of rubber, the sewing machine, and the successful operations of railroads. This new industrial age was calling for the machine technologist. Such a mechanical revolution would have its effects upon the mining and the mineral industries. A new leader would be a prime necessity. It was becoming apparent that the new industrial changes would have their effects upon the mining and the mineral industries. A new leader in mining, metallurgy, business, and agriculture would be a prime necessity. It was becoming apparent that the new industrial changes would also revolutionize demand in the fields of chemistry, physics, and geology.

The colleges of the day were not organized or equipped to train the new technical leaders of industry. Many colleges of that day had been founded by religious denominations, and the administrators were often ministers of the gospel. With their curricula loaded with classical and theological subjects, there was no place for a technical program leading to a degree in engineering. The ambitious youth looking forward to a career in the physical sciences, mining, or metallurgy would scarcely devote three or four years to study in these institutions.

Second among the background factors for producing a School of Mines was the movement for more democracy in our government, social life, and education. This movement had been particularly stimulated by the administration of Andrew Jackson and the influence of the American frontier. This democratic tide had carried with it such reforms as universal manhood suffrage, abolition of property restrictions on voting, extension of the public school system, and demands for equality of opportunity. This same movement with its insistence upon the rights and privileges of the common man naturally looked with disfavor upon the extant higher institutions of the period.

When it became apparent that the states lacked the necessary means to found such schools of learning, its advocates went with their petitions and memorials to the Federal Government. During the 1850's

such petitions met considerable opposition in Congress. The southern influence was still predominant in Washington and both Presidents Pierce and Buchanan were pro-Southern in their policies. The Southern congressmen being advocates of states rights and thus opposed to the centralization of authority at Washington, were likewise hostile to any scheme of federal subsidization of education. To them it looked like federal encroachment upon a field reserved to the states. Hence, the advocates of the new so-called agricultural and mechanical colleges had to face antagonism from southern congressmen and from unfriendly presidential administrations.

An attempt was made during the Buchanan Administration to establish a new group of institutions by the avenue of land grants. Representative Justin H. Morrill, of Vermont, introduced such a measure into the House of Representatives on December 17, 1857. This measure passed both houses of Congress, but was stopped by a presidential veto. The votes necessary for overriding the veto were not attained. President Buchanan stressed in particular the typical states' rights opposition to such a measure. He believed that Congress lacked the power to give away public lands, especially for the purpose of education. To him education belonged primarily to the states, and was in no way the responsibility of the Federal Government. Succeeding events were soon, however, to put into operation a land-grant system of education which to Buchanan was unconstitutional.

As a result of the national election of 1860, the southern and states' rights influences in the national government were weakened with the victory of the new Republican party and the election of Abraham Lincoln to the presidency. By the next year the southern influence at Washington definitely ended, when eleven southern states withdrew from the Union and joined the Confederacy. With the states' rights opposition removed and with the new Republican party dedicated to such broad national measures as the building of transcontinental railroads, national regulation of banks, and free homesteads for the masses, the advocates of land grants for the new agricultural and mechanical colleges made real progress. With liberal land subsidies being granted to such projects as the Union Pacific Railroad, why not have similar grants to colleges for the masses? Possibly the Civil War had its effect in hastening the passage of such an act. The need for military officers was clearly revealed in the early months of the war, and such a land-grant system of colleges could furnish a supply of officers for the nation in a future war. If the national government granted the land, could it not expect some return in the form of a trained citizenry? The exact military influence in the legislative victory is difficult to estimate.

The bill which culminated in the famous Morrill Act was introduced into the Senate on May 5, 1862. It was similar to the measure vetoed by President Buchanan, except that it provided for a donation of thirty thousand acres of land for each senator and representative in Congress from a particular state, instead of twenty thousand acres. On June 10th, the bill passed the Senate by a vote of thirty-two to seven; the House then acted favorably on June 17th by a vote of ninety to twenty-five. The bill became law by virtue of President Lincoln's signature on July 2, 1862. This law is described by Professor H. U. Faulkner, the historian, as being "the most important single piece of educational legislation in our history—the Morrill Act of 1862."

It is an interesting historical event that Congress could consider, debate, and pass such a far-reaching act of legislation, when the energies of the Federal Government were so absorbed in a fight for its very existence. At this very time Washington was being threatened by the Confederate armies of Lee and Jackson. In fact, the next month, August 1862, Lee began an invasion of the surrounding area of Maryland, ending in the bloody battle of Antietam. For such a progressive legislative act to be enacted in a time of civil strife shows the temperance and the extreme foresight of certain congressmen who could look ahead and visualize the future needs of American education.

Representative Morrill, in an address before the House of Representatives on June 6, 1862, cited the specific need for the new type of education prescribed by the measure. He spoke of the proposal as "just in scope, demanded by the wisest economy, it will add new security to the perpetuity of republican institutions." As for the proposed colleges, and the type of training elaborated, Morrill had this to say: "this bill proposes to establish at least one college in every state upon a sure and perpetual foundation, accessible to all, but especially to the sons of toil, where all the needful science for the practical avocations of life shall be taught, where neither the higher graces of classical studies, nor that military drill our country now so greatly appreciates will be entirely ignored."

One of the most elaborate and well prepared statements on the objectives of the land-grant college was given by James S. Rollins, father of the University of Missouri, in the state legislature: "The specific object of the grant is for industrial education . . . to unite, if you please, headwork and handwork; to guide muscle by brain; to get more from the soil; to multiply and at the same time save labor by machinery and inventions; to improve the breed of all domestic animals; to aid in mining operations and the reduction of ores; to assist the geologist, the mineralogist, and the chemist. . . . in short, to

enable men to live better and with less labor by better understanding of the laws of nature. . . ."

The Morrill Act granted thirty thousand acres of public land for each senator and representative in Congress from a particular state. As Missouri at the time had eleven members, the grant to this state totaled 330,000 acres. This act specifically provided that the land could not be sold for less than \$1.25 per acre, which meant a total endowment of \$412,500 for the state of Missouri. The fund was to be invested as an endowment and was under no circumstances to be used for the construction or the repair of buildings.

The Missouri General Assembly by joint resolution accepted the land grant of Congress on March 17, 1863, with all the conditions and limitations imposed in the act. This legislative session did not, however, act on the proposed college, and it was seven years before the school was founded. The state was required to accept and claim the benefits under the Morrill Act within a period of five years by the establishment of at least one college. Congress, on July 23, 1866, came to the rescue of those states that had not as yet acted, by passing a measure extending the time by an additional five years for all states that had accepted the original grant within two years. It is an interesting commentary that Governor Thomas C. Fletcher was evidently unaware of this extension of time by Congress, since in his message to the General Assembly in January, 1868, he stated that the allotted time would expire in sixty-nine days, and that the state must act or lose the 330,000-acre land grant. It was four years from the date of extension until favorable legislative action was achieved.

The struggle in Missouri over the disposition of the land grant was perhaps the most bitter of that in any of the states. The struggle centered largely around such matters as the location of proposed school, the question of its relation to the existing state university, and the type of institution that should be founded. Many bills were introduced into the General Assembly during the period from 1863 to 1870, embodying the various ideas as to the type of school to be established. Whereas, some particular measure was introduced in nearly every session after 1863, the discussion here will review only the action of the Twenty-Fifth General Assembly, which passed the legislation establishing the school.

The regular session of the Legislature convened on January 6, 1869, and adjourned on March 4 of the same year. On January 5, 1870, came the adjourned session which passed the act "to locate and dispose of the congressional land grant of July 2, 1862." The controversy in the General Assembly by the time of the Twenty-Fifth Session in 1869 and 1870, was largely over the location of the proposed

institution. The division was now largely between those who wanted to locate the new land-grant school in connection with the university at Columbia and those who wanted it to be separate from the existing state university and located elsewhere. The leader of the forces to locate the new institution at Columbia was James S. Rollins, Representative from Boone County. Those opposing the university forces were divided as to the exact site for locating the new institution. This had a tendency to weaken the anti-university group. By the time of the 1870 adjourned session, a group of legislators insisted that the School of Mines and Metallurgy be located in the mining district of Southeast Missouri. Although willing to locate the School of Agriculture at Columbia, they persisted that the School of Mines and Metallurgy be located elsewhere. Also another feature of importance to future history was that they were willing to place the School of Mines under university administration.

The measure from which the School of Mines emerged was first introduced by Rollins on January 14, 1869. It was entitled as an act to enlarge the University of the State of Missouri, by establishing therein the department of agriculture and mechanic arts, and to provide a means of maintaining said department. It further called for the support of Lincoln Institute in Cole County. This was essentially the same measure which passed in 1870, except for the provisions establishing the School of Mines and Metallurgy. At first the proposal was sent to the committee on education and on February 18th was taken up on the floor of the Senate. Several amendments were offered to the Rollins bill. One of them, an amendment by Senator T. J. Morrison, providing for a School of Mines and Metallurgy, lost by only one vote. On February 27th, the bill passed the Senate by a vote of nineteen to ten. It was sent to the House and reported to the committee on education, where it remained until the adjourned session.

The adjourned session opened on January 5, 1870, and the Rollins bill was reported from the committee on education. Substitutes for the bill were offered, such as the one providing for a separate and independent agricultural and mechanical college to be located near Springfield. Greene County was to donate not less than \$100,000 in cash and not under 640 acres of land. With the forces thus in an apparent deadlock, Representative William N. Nalle, of Fredericktown, came forward with his amendments. Section one of the measure was amended to include provisions for a School of Mines and Metallurgy. This was agreed upon. Then Nalle proposed that the said school be located in the mineral district of Southeast Missouri in a different location from the College of Agriculture, which was to be located at Columbia. The amendments further provided that the Board of Cura-

tors of the University would select the site for the proposed school in that county in the mineral district which would donate the greatest amount of land and money.

Amendments to strike out Southeast Missouri and open the location to all counties of the state were defeated. So the Rollins measure with the Nalle Amendments passed the House on February 3, 1870, by a vote of seventy-nine to forty-one. On February 9th, the bill was taken up in the Senate and the amendments approved by an eighteen to six vote. Then on February 24, 1870, Governor McClurg signed the measure. Jonas Viles, in his centennial HISTORY OF THE UNIVERSITY OF MISSOURI, considers this date as second in importance only to the Geyer Act of 1839. For the School of Mines it is the most important single date, as it represents the legal creation of the institution.

The act of February 24, 1870, establishing the School of Mines and Metallurgy, provided that the school be located in the mineral district of Southeast Missouri. It further provided that any county having mines within said district was to donate to the Board of Curators an amount not less than \$20,000 in cash and not less than twenty acres of land. The act further stipulated that the said school would be located in that county donating the greatest amount of land and money.

A committee of the Board of Curators was duly selected to examine the bids of the various counties competing for the school. This committee on location consisted of A. J. Conant as spokesman, James S. Rollins, F. T. Russell, B. F. Northcutt, W. W. Orrick, and O. S. Reed. Whereas, at least four or five counties made efforts to obtain the school by one means or another, in only two counties were the bids of a sufficient character as to warrant examination. These two counties were Phelps and Iron. According to the University Catalog for the year ending June, 1871, the former county was "awarded the prize."

Colonels Russell and Northcutt were then appointed as a sub-committee to visit the two competing counties and appraise the respective bids. This sub-committee devoted about two weeks to its task of looking over the offers of the two counties, and their proposed sites for the school. After inspection of the Iron County grant, the committee visited the proposed site at Rolla. The bond offers of the two competing counties were not so exacting to appraise, but the problem of placing a cash value upon land was extremely difficult. Nevertheless, the curators decided in favor of Phelps County, with an estimated bid of \$130,545, as compared with the estimated bid of Iron County at \$112,545. The bid of Phelps County included \$75,000 in county bonds

and \$38,545 in land. Also included among the land grant was the 130-acre tract known as Fort Wyman Hill, lying south of Rolla, which was the original planned site for the school campus.

Following the final decision of the committee on location to establish the school at Rolla, the curators, on December 20, 1870, accepted the report. The General Assembly made the Phelps County land grant legal in turning over the lands to the curators. The board then took the first steps to put the institution into operation.

At the December meeting, a building committee was appointed to supervise and receive plans for the first building of the school. In the following spring, the Board of Curators appointed a committee to seek and to recommend a professor of Mining and Metallurgy, who in turn should recommend two assistants. For some three or four months during the summer of 1871, President Daniel S. Reed, of the state university, and the special committee communicated with and consulted some of the most outstanding scientific men of the nation. The seeming delay in opening the school was due to the many complicated problems commensurate with the initiation of such a scientific institution.

In 1871, engineering education was in its infancy. Possibly the curators themselves could not visualize the many requirements that would be necessary to establish a School of Mines and Metallurgy. How would such a school be administered? What would be taught? What kind of scientific equipment would be necessary? How could the theoretical courses be taught so as to train practical engineers and scientists? These and many other problems made the establishment of a School of Mines and Metallurgy seem an insuperable undertaking.

The university officials faced great difficulties in the selection of a director qualified in the realm of administration and in the technical skills demanded for such a position. But as events occurred it appears that good luck or providence was on the side of the officials when they found a man who was preeminently fitted for the difficult task of directing the new institution. This man was Charles Penrose Williams, who at the time was Professor of Chemistry at Delaware College and who was also State Geologist. Professor Williams was an all-around scientist since he had had experience in Mining Engineering, Metallurgical, Geology, and practical Chemistry. He was selected at a board meeting in August, 1871, and in September arrived in Rolla to assume his duties as first director of the Missouri School of Mines and Metallurgy.

The tasks confronting Professor Williams on his arrival would seem insurmountable to the educator today. In the first place, the status of technical education on the college level had not as yet won the

respect which the classical studies enjoyed. Secondly, he had to found an institution where the practical application of the physical sciences would be attempted and in which there was no school tradition, grading system, or other precedents upon which to build and continue an institution. And third, there were no college buildings or laboratories. Professor Williams did not have the advantage of a faculty, tradition, or well-evaluated curricula awaiting his inauguration. In spite of the many difficulties Professor Williams entered into his work with great zeal and undying enthusiasm.

In the summer of 1871, the Rolla Public School Board had completed plans for the construction of a building for its schools. Director Williams, shortly after his arrival, began negotiations with the Rolla school officials, for a portion of this building as temporary quarters pending the construction of the proposed permanent School of Mines building. As a result of Williams' untiring efforts this request was granted.

As the new Rolla Public School building was to be completed about November 1, 1871, the opening date for the School of Mines was fixed and advertised as being November 6th. Rooms were secured in the public school building, and on November 23rd the school was formally opened with a very impressive and elaborate ceremony.

Many newspapers throughout the state carried advanced notices of the formal opening. These notices particularly emphasized the prominent officials who were to be present for the occasion. The ceremony was even more significant for local history in that the Rolla Building, which later became the property of the school, was dedicated by the city of Rolla on the same day as a public school building.

A large crowd assembled for the momentous occasion, despite the very unfavorable weather and heavy snowfall. Among the outstanding personages attending the ceremony were President Daniel Read of the University, who delivered the dedicatory address; Colonel William F. Switzler, publisher of (Columbia) MISSOURI STATESMAN; the Honorable John Montieth, State Superintendent of Schools; and the following members of the Board of Curators; A. J. Conant, O. S. Reid, Elijah Perry, S. G. Williams, and Edward Wyman. Also a number of state legislators and other prominent state officials participated. The significance of the event was recorded in the University of Missouri Catalog by the following statement: "The occasion was regarded as historic in its character, and as inaugurating an institution which is to last as long as the state itself."

The dedication program was held in the afternoon on the east half of the second floor of the Rolla Building. The major events were the dedicatory address by President Read; an inaugural address by the

first director, C. P. Williams; and congratulatory remarks from the public schools of Missouri by the State Superintendent, John Montieth.

The speech of President Read was very fitting for the occasion, and it might be well to quote some of the highlights of the inspiring oration. Excerpts of his address are: "The newspapers of the state may perhaps notice the fact, that the School of Mines connected with the University of the State, was formally opened in the town of Rolla on this, the 23rd day of November, in the year of our Lord 1871, with an attendance of students quite as large as under the circumstances could be expected.

"Yet this occasion, insignificant as it may seem to some, makes a part of the history of this great State for all time to come. We are today, in opening this school performing an historic act. Not so with many of those occasions which attract present attention, and even a wide-spread notoriety. They pass away with the noise and bustle which they create, and leave behind them no permanent record—no enduring monument. How different the work of this hour. **THIS SCHOOL NOW COMMENCING WILL LAST AS LONG AS THE STATE ITSELF.** Nay, would the state change—should it become dissevered, from our great republic—not change, or revolution, or dissolution, or the shock of war would destroy this institution of science. Nothing short of the destruction of civilization itself can blot out or efface the beginnings which we here and now make. . . ."

In a charge delivered directly to Williams, the confidence of Read in his new director is clearly revealed: "I repeat, we demand success; and, sir, my faith is unwavering—you will succeed. Your name will go down with this school as its first director. Under your directorship the school will become one of the most noted of the land."

The dedication service was continued in the evening in the Rolla Methodist Church. The program was somewhat similar to that of the afternoon with speeches stressing the historic importance of the events of the day. Switzler particularly emphasized the great asset the School of Mines would become to the state. So ended the great occasion of historic importance to the State of Missouri.

At last Missouri had an institution after a struggle that had endured for about eight years. Whereas, the future seemed bright, and at the time of dedication, great hopes were expressed for the rapid development of Missouri School of Mines, there followed years of struggle, adversity, and general uncertainty, when it seemed that the actual existence of the institution was at stake. Such years of struggle have been present in the history of many colleges and in the case of the School of Mines were a result of many factors. One was the lack of adequate support from the state legislature to meet the expenditures

demanding by such a school. Another contributing factor was the general feeling that the institution was primarily a Phelps County institution, and this without doubt tended to lower the enrollments in early years. The university at Columbia faced the same difficulty during its early history in the general reaction over the state and even in the legislature that it was a Boone County institution. Another factor that led to difficulties for the school soon after its founding was the panic of 1873, and the depression which followed this crisis. Economic depressions even today have an adverse effect on college enrollments. This was true in an age when going to college was by far the exception rather than the rule. Many questioned the need for technical education and the value of such training on the college level. These initial difficulties meant that several years elapsed before the school experienced a permanent growth and prosperity.

CHAPTER II

THE FIRST DIRECTOR, CHARLES P. WILLIAMS

1871—1877

The school opened under bright auspices. Williams began his work with enthusiasm and vigor. In addition to his administrative duties as director, he was also a professor of General and Analytical Chemistry, and of Metallurgy. Nelson W. Allen of the university was appointed Assistant Professor of Mathematics and also was the first secretary to the faculty. William Cooch was an assistant in Analytical Chemistry and Assaying. These three educators made up the first faculty and administrative staff of the School of Mines. The University of Missouri Catalog for the first year lists two other chairs, that of Applied Mathematics and Engineering, and of Geology and Natural History. The catalog merely states that these were filled by other instructors, presumably by Williams and Allen.

The wide range of subjects taught by Williams was more or less characteristic of college professors' teaching loads in that day. An evaluation of the course offering indicates the wide variety of subjects which Williams must have given. Of course, it was probably true that not all courses listed in the first catalog were actually taught. Nevertheless, he must have given in addition to his specialty in Chemistry, work in all the other fields offered except Mathematics.

The enrollment for the first year as listed was twenty-eight. This included eight first-year or regular students, three specials, and seventeen enrolled in the preparatory department. Nineteen of the twenty-eight are listed as Rolla students and most of the others were from the local area. The first year students were: Otto B. Amsden, G. A. Duncan, John H. Gill, John Pack, Millard Godwin, George Richardson, Edward Taylor, and H. A. Williams. Of this group, Duncan, Gill, and Pack, completed the work for degrees and became the school's first graduates.

One of the first students and first graduates, G. A. Duncan, writing for the ROLLAMO in 1908-09, relates early experiences and some of the activities of this first class that are worthy of mention in this treatise. At first, he reports, Gill came in daily by rail from his father's farm on the Piney River, and Duncan rode ten miles on horseback to attend classes. Later, he describes how they formed a club and stayed together on what might be termed a cooperative basis, in what was perhaps the first eating club ever formed at the school. The living

quarters consisted of three rooms over the Morris Hardware Store. They had a negro boy for a cook and a special room for study where the rules for silence were strictly enforced. Duncan estimated their total expense at \$3.00 per week.

A detailed list of curricula for the school year by year would be an uninteresting mass of data; in order to give the present-day student and reader some conception of the beginning course of study, the curricula offered the first year has been included. As will be noted the school at the beginning established a preparatory department. During this year the majority of students were enrolled in this particular department. Practically all colleges of that day had such departments primarily because of the lack of high school facilities at this early date. The work given in the few secondary schools was not in any way organized to prepare students for a school of technology. It was considered an absolute necessity to prepare students before they could hope to meet the real competition of technical college work.

The preparatory offering included these courses:

- Algebra—to Quadratic Equations
- Arithmetic—Metrical System
- Rhetoric and Composition
- Natural History—Botany (Structural and Systematic)
- Elementary Chemistry—Elementary Physics
- Physical and Industrial Geography—Lectures

The regular technical subjects leading to a degree included the following courses required for the three years of college work:

FIRST YEAR

- Algebra—finished
- Geometry
- Trigonometry—begun
- Mensuration
- Surveying and Field Practice
- General Chemistry and Chemical Philosophy
- Physics
- Mineralogy—Descriptive and Determinative
- Crystallography
- Outlines of Zoology
- Analytical Chemistry
- Blowpipe and Humid Qualitative Analysis
- Drawing—Mechanical and Free Hand

SECOND YEAR

- Trigonometry—finished
- Analytical Geometry

Calculus
Surveying—Field Practices, Projections, Shades, shadows
Descriptive Geometry—begun
Machinery and Motors
Chemistry—General and Industrial
Metallurgy
Physics
Analytical Chemistry—Qualitative and Quantitative Humid Analysis
Geology—Physiographical, Dynamical, Historical Lithology, Phenomena
of Veins and Mineral Deposits
Drawing—Free Hand and Mechanical

THIRD YEAR

Calculus
Analytical Mechanics
Applied Mechanics
Field Practice and Engineering Topography
Metallurgy and Assaying—Wet and Dry Methods
Analytical Chemistry—Quantitative Analysis
Machinery and Motors
Mining—Methods of Explorations and Exploitation, Extraction, Crushing and Concentration, Mining Regions
Drawing—Maps, Plans, and Sections of Mines
Towards the close of the third year, a course of lectures will be delivered by the President of the University on Mining law. Throughout the course, evening public lectures on Human Physiology and Domestic Hygiene, and on special scientific studies, will be delivered.
French and German are optional studies.
In accordance with the requirements of the "Agricultural Land Grant Act", provisions are made for instruction in military tactics.

All applicants for preparatory courses were required to be at least sixteen years of age, and to stand examination in the ordinary branches of an English education. Completion of the preparatory program admitted the student to the regular college course without examination. Those who sought admission to the first year program had to be at least seventeen years of age and to stand an examination in all the subjects of the preparatory year. Special students were admitted to any department without an entrance examination, but they were not entitled to a degree. They were, however, issued certificates of proficiency upon the satisfactory completion of any course which they might elect.

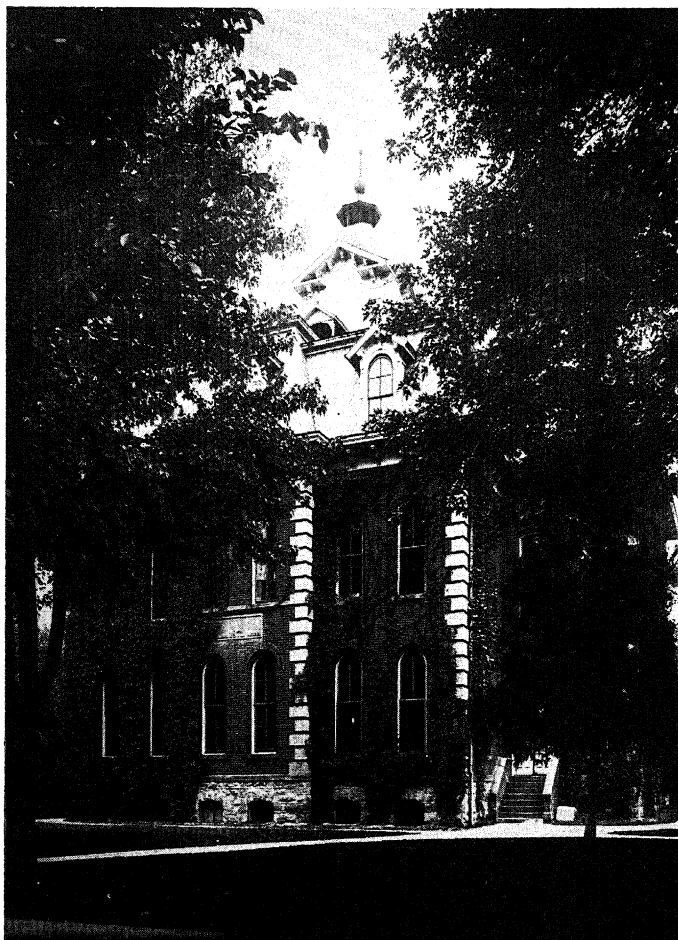
The school opened without a well-formulated program for a degree. It was perhaps natural that a well-balanced curricula and a well-integrated program for degree work could not be systematized during the first year. There were no candidates for degrees the first year, the most advanced group of students were those enrolled in the

first-year courses. It was apparent that the future of the school in relation to curricula, degrees, and general policy was committed to subsequent developments. Nevertheless, the catalog report for the first year ending June, 1872, listed the degree of Mining Engineering (M.E.) which was to be conferred upon candidates who successfully completed the three years' work. The Missouri School of Mines did not publish a bulletin until the second school year, 1872-73; therefore, the first report was contained in the University of Missouri catalog. It is interesting to note that the catalog for the second year, the first published by the school, does not mention the degree or degrees to be conferred. The following statement was carried in regard to increasing specialization: "It is a school of Technology, with Civil and Mining Engineering and Metallurgy as specialties." The major innovation in the curricula for the second year of school, was the adoption of the graduation thesis for the second semester of the last year.

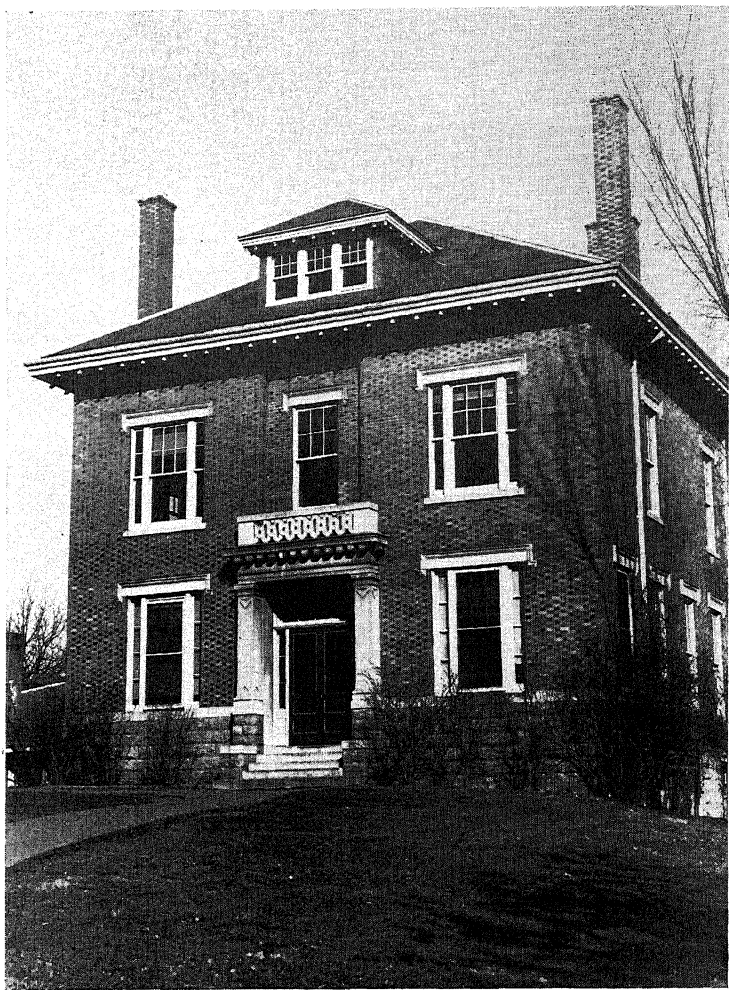
The school showed evidences of remarkable growth by the second year after its founding. The enrollment increased to a total of seventy-five. This figure was made up of seventeen college or regular technical students, twenty-five specials, and thirty-three preparatory students. The special students showed the greatest percentage of increase over the first year. They consisted almost entirely of Rolla students, and nineteen of them were women. All those enrolled for preparatory and regular technical subjects were men.

This second year also brought new additions to the faculty. James Albert was elected by the Board of Curators in June, 1872, as Professor of Applied Mathematics and Civil Engineering. He was listed in the catalog as Professor of Civil Engineering and Drawing, but by the following year he is listed as being Professor of Applied Mathematics and Graphics. Nelson W. Allen was Professor of Pure Mathematics, and William Cooch had been promoted from Assistant in Chemistry to Professor of the English branches. William E. Glenn was lecturer on Anatomy, Physiology, and Hygiene. John Holt Gill, one of the students, had the honor of being designated as the first school librarian.

The progress of the institution so notable during the second year, was even more phenomenal by the third year. The enrollment, which had tripled the second year over the first, again registered for the third year an increase of approximately fifty per cent. This registration figure of 107 was, however, to mark the peak enrollment for the Williams Administration. The above figure analyzed shows a total of twenty-four enrolled as regular technical students. This marked a threefold increase over the opening year. The most startling increases were, however, in the special and preparatory categories. The specials



ROLLA BUILDING, FIRST BUILDING ON CAMPUS



ORE DRESSING AND METALLURGY BUILDING

now numbered twenty-nine and the preparatory group fifty-four. Although local students from Phelps County still predominated in the list of enrollees, there is a wider geographical distribution. There were three, for example, from outside the state and six from St. Louis.

The course of study leading to degrees had been more thoroughly formulated by the 1873-74 term. Along with the degree of Mine Engineer, which had appeared in the first catalog, there were now included two additional degrees. They were the degrees of Civil Engineer (C.E.) and Bachelor of Philosophy (Ph.B.). In addition, a program with some differences in the course offering had been elaborated for those seeking the various degrees. As would be expected, the first year was the same for all curricula, but by the second year the student could begin to specialize. A close examination of the requirements for the course in Philosophy will reveal that it differed only slightly from the work in Mine Engineering. To show that graduation requirements would be strictly enforced, the catalog carried the statement that the courses of study would be rigidly enforced on all seeking degrees. In order not to discourage those electing the more liberal and non-technical subjects, the school bulletin published the fact that special students would be admitted at any time and would be allowed complete freedom in the selection of their subjects.

The 1873-74 catalog marked a distinct improvement over the first two bulletins, as brief treatises were included describing the work done in each department. This was an improved source of publicity, as prospective students, friends, and people over the state could obtain a more comprehensive knowledge of the work actually done at Missouri School of Mines.

The curricula were divided into departments of instruction for the first time in the 1873-74 catalog. The departments listed included Pure and Applied Mathematics, Analytical Chemistry, Metallurgy, Physics, Geology and Mineralogy, Civil Engineering, Graphics, Mine Engineering, and the department of English or Preparatory.

The School of Mines faculty for the third year was increased by the addition of two professors. George D. Emerson was appointed as Professor of Civil and Mine Engineering; and R. W. Douthat as Professor of the English branches and head of the Preparatory Department. These professors served throughout the remaining part of the Williams Administration and through a considerable part of Director Waite's term. Director Williams still served as head of the Chemistry and Metallurgy Departments. Professor Abert was head of the Department of Applied Mathematics and Graphics. Nelson W. Allen continued as Professor of Mathematics and in addition served as Secretary to the Faculty.

Perhaps the most outstanding event for the term of 1873-74, was the school's first commencement exercise. The three students who had enrolled at the opening of the institution in November 1871, had completed the three-year technical course and hence were candidates for degrees. The candidates began work on their respective graduation theses at the beginning of the spring term of 1874. Their projects had been completed by March 30, and on this date the faculty, after a careful examination of the graduation theses, recommended to the Board of Curators the three students as candidates for degrees. Gustavus A. Duncan and John Holt Gill were recommended for the degree of Civil Engineer, and John Wallace Pack was recommended for the degree of Mining Engineer. Gill led the class with an average of 9.69 on a scale of 10, and it was recommended to the board that he be given special honors. The subjects of the presented theses were:

Gill, "Drawings and Descriptions of Original Machines"

Duncan, "Economics of Common Roads"

Pack, "Spelter Production"

The Board of Curators promptly approved the action of the faculty, and in June, 1874, the degrees were conferred. The principal speaker for this first School of Mines commencement was the Honorable Albert Todd of St. Louis. The charge to the graduates was delivered by Director Williams.

The degrees of Civil Engineer and Mine Engineer were conferred upon Francis J. Degan and Almon W. Hare, respectively, in the spring commencement of the succeeding year. The first Certificates of Proficiency granted by the school were presented at this commencement exercise. Those who had the honor of being the school's first licentiates were: Peter Blow and Christian R. Winters in Analytical Chemistry; Florence E. Whiting in Mathematics; and John MacGuire in Chemistry and English. In the two succeeding commencements of the Williams Administration, five received regular degrees in 1876 and three in 1877. This constituted a total of thirteen bachelor degrees granted by the school during the first school administration.

A problem which received serious consideration by the faculty in the early years was student discipline. While perhaps some of the rules and regulations appear extremely harsh and childish to us today, it must be remembered that the moral citizenship training for the individual was considered about as significant as subject matter in the 1870's. The college was a place for citizenship training as well as a group of classrooms in which the formulas of chemistry were committed to memory.

There evidently was not a fixed policy of discipline, but rather a more or less flexible series of rules and regulations which were often modified in relation to individual cases and situations. The most common disciplinary measure taken by the faculty for infraction of the rules was a system of demerits. The faculty occasionally fixed a definite number of demerits for particular offenses, but such rules were often changed by faculty action in individual cases. The number of demerits charged against a student often varied according to the number of times the offense was committed and the subsequent promises of the student to conform and to devote himself more diligently to his studies.

The faculty, at one of the first meetings in the fall of 1872, established a system of demerits for those incurring absences and tardies without excuse. An unexcused absence was the equivalent of two demerits, while two unexcused tardies carried one. The penalties for an excessive number of demerits were enumerated; a total of twenty-five resulted in a note to the parents and fifty demerits entailed suspension from school. In almost all of the early faculty meetings the records of student absences and tardies were discussed and the demerit penalties registered.

In the spring of 1873, two students having acquired more than fifty demerits were each suspended for one month. Another offender with slightly more than fifty demerits was expelled but was readmitted by the faculty because of his youth and at the request of his father. Two other students with sixty and sixty-four demerits were expelled for one month and were given thirty-six hours in which to start for home. The faculty displayed great horror at an expelled student "loafing" in town.

Another problem coming before the faculty was the use of intoxicants by students. Disciplinary measures varied widely on this question. On September 22, 1873, the faculty voted that any student becoming intoxicated at the St. James Fair would be publicly expelled from school on the following morning. The most common action in regard to intoxication was to make the guilty student sign a pledge never to enter a saloon or to become intoxicated for the remainder of the year. In the spring of 1875, a student guilty of patronizing a saloon was brought before the faculty which assigned the penalty as eight demerits, and in addition made him sign the faculty minute-book that he would never again, while in school, visit a saloon. The pledge further stated that a violation would imply automatic expulsion.

The matter of orderliness in the building and about the campus was also covered by rules. One of the first disciplinary regulations to appear in the minutes prohibited loitering around the building or on

the school grounds. Between classes no student was to wander about the halls or campus without permission. He was to be either in class or in the library preparing his lessons. In no case could a student leave school before the close of recitations except with an excuse from the parents.

Director Williams was evidently a good disciplinarian. He was firm in his rules and actions but was very considerate of the students. Each case was studied thoroughly and then action was taken after a consideration of all the facts involved. After making a definite conclusion in regard to a case, he demanded complete execution of his decision. Williams seems to have commanded the respect of the entire student body.

The efficient and prompt manner in which he conducted the explosive Blow-McCown affray attests to his ability as a disciplinarian. This affair, which attracted so much attention and could have easily created a serious division among the students or could have given the school unfavorable publicity, was handled in an impartial and expeditious fashion. The decision in this difficult case aroused almost no spirit of rivalry, and the affair seems to have been forgotten after a few weeks. However, the incident did create much excitement both in school and in town. Because of the excitement produced and the amount of publicity received, the Blow-McCown duel deserves a place in this history.

On Friday, April 4, 1873, Sergeant Peter Blow was issuing arms to the members of one of the military companies located at the school. There was a rule to the effect that no one be allowed to enter the armory, or touch any of the weapons with gloveless hands. On this particular day, John W. McCown, a Private, walked into the armory and proceeded, without gloves, to procure his weapons. Blow then requested McCown to step out and put on the required gloves. A struggle ensued in which Blow attempted to oust McCown by force, but a group of students intervened and kept the fray from developing into one of violence. McCown evidently felt that his honor had been insulted, which nothing short of a duel could restore. As the duel had once been a means of preserving personal honor, McCown wrote a challenge and had it delivered to Blow. The latter, on advice of his friends, refused to reply.

The following Monday morning, as the two contestants met near the school building to talk over their differences, McCown shot Blow twice. The victim's wounds were pronounced serious but not necessarily fatal. After receiving medical treatment, Blow was taken to his home in St. Louis for recovery.

On April 9, Williams called the faculty into a special meeting to take action in regard to the case. The faculty promptly voted to expel McCown from school. W. C. Minger who had delivered the challenging note, was also expelled, but his sentence was modified to expulsion for only the remainder of the term. Blow returned to school on April 23, and was brought before a special meeting of the teaching staff. He was freed of all implications in the duel, but because he had violated a rule of the school by laying hands on a fellow student he was given eight demerits. Director Williams, in a letter addressed to Peter Blow's uncle, the Honorable Henry T. Blow, explained in a very diplomatic style how the demerits against his nephew were not a result of the encounter with his antagonist but because his action constituted an offense against the school; he had tried, by force, to oust McCown from the armory.

In January, 1873, instruction in Military Science and Tactics was instituted at Missouri School of Mines. This was considered as one of the obligations of the school under condition of the congressional land grant. Major J. W. McMurray of the University of Missouri, came to Rolla to inaugurate the program. He remained for two weeks giving instruction in military drill and making temporary appointments for the first organized company. This company became known as Company G of the University Battalion. The first cadet officers included John H. Gill as First Lieutenant, G. A. Duncan and Peter E. Blow as Sergeants, and R. E. Winters as Corporal. Cadet officers were elected by the faculty following the organization of the first company.

Among the many applications and petitions to the faculty those requesting excuses from military drill were most numerous. At almost every faculty meeting these petitions were considered. At first the school authorities adopted a very strict policy in regard to exemptions from military drill, but toward the close of the Williams Administration became more liberal. As in disciplinary infractions, each case was decided on its own merits. By the fall of 1874, an application from his father resulted in an excuse from drill for a Charles Winters. Special students were often excused, and of course those with physical disabilities were exempted. No exemptions were permitted without sufficient evidence to warrant such action. At the beginning of the fall semester of 1874, several petitions for exemption from drill were rejected by the faculty because the parties had been seen loitering about the school building during the hour of military exercise.

Certain rules governing the program of military training were promulgated by the faculty from time to time. Following the Blow-McCown affair a regulation stated that no student except commissioned

officers, or sergeants and corporals detailed for the purpose, be allowed to enter the armory for guns. There were to be no excuses for not wearing uniforms in drill except in case of repairs, which could extend no longer than two days. The drill periods, in the fall of 1875, were held for one hour on four days of each week. The next year, the period was reduced to three-quarters of an hour on three days per week.

Military training was abandoned at Missouri School of Mines in 1877, at the close of the Williams Administration. This action was the result of the economic depression which caused a decline in school revenues and enrollment. The question of the resumption of military training came before the faculty at a meeting on September 17, 1880. At this meeting a majority voted in the negative on the basis that the resumption of military training with such a small enrollment would be "a ridiculous farce."

An athletic survey of the period from 1871 to 1877, must of necessity be brief. This was before the era of intercollegiate athletics, and such activity as existed was entirely of an intramural character. The faculty frowned upon play or any kind of sports during the regular school hours. In September, 1874, a number of students petitioned the faculty for permission to play games during the periods for which they had no recitations. The faculty turned down the petition with the command that those desiring fun and play be required to go to the library and prepare their next assignments.

Of course, after school hours students participated in games. The integration of athletics with the regular college program had not as yet developed. Among the sports participated in by the students, baseball was perhaps the most important. Lee R. Grabill, who entered the School of Mines in 1875, in a later account in the *MISSOURI MINER* gives a brief account of the early baseball teams as follows: "Of course, we had a baseball team or two. Our equipment consisted of balls and a few bats. Gloves, masks, and pads not yet had been heard of. We used the hard professional balls, and I still have some crooked fingers as a result."

A number of student societies were organized almost from the time of founding of the school. They were not as a rule societies for social entertainment but rather they were to develop the literary and oratorical style of the student. They sought specifically to train the student in the art of debate and public speaking. In January, 1874, a literary, debating, and dramatic society was formed. Its objects were to improve the public and private exercises of its members. The faculty gave the society permission to use a room at the school for its public performances. The so called exhibitions, or public literary entertainments, were a popular event in the early history of the school. The

subjects for the declamations were usually broad, general topics on which the orator could expound to considerable lengths. They would be terrifying subjects for the debate coach of the present. At an exhibition given in December, 1875, declamations were given on the general subjects: Pleasures of Science; Scholars and their Duties; Death of Napoleon; and the Duties of American Citizens. Occasionally the entertainments were given to raise funds for some specific cause. Sometimes the literary entertainment would be coordinated with a musical program. At one such entertainment on June 28, 1876, the program consisted of essays, declamations, music, a debate, and the reading of an original poem. Aside from a few athletic teams and the literary and dramatic societies, there were few other extra-curricular activities during the early period of the school history.

It will be recalled that the original proposed site for the School of Mines campus had been the Fort Wyman tract lying to the south of Rolla. It had been anticipated that the school building would soon be constructed on the Fort Wyman Site. But by 1872, many obstacles had appeared to thwart the curator's plan for the new building, and the Rolla school building was leased for a second year. At a meeting of the Board of Curators the next year, June 1873, the question of the location of the school campus was thoroughly debated. On April 1, 1874, the board met at Rolla, and here a special committee was appointed to consider the relocation of the site for the institution. This committee was further instructed to investigate the terms upon which a possible purchase of the Rolla public school building could be effected. In January, 1875, the Rolla Building was finally purchased for the amount of \$25,000 and the campus site was permanently changed from Fort Wyman Hill to its present location. The Board of Curators, in June, 1875, voted special thanks to the citizens of Rolla for their donation of the lot for the use of the school.

Williams heroically endeavored to make the School of Mines and Metallurgy one of the great institutions of the nation. It was largely as a result of his inspiring guidance and leadership that the institution made such remarkable growth during the first four years. The success of Williams brought very favorable publicity for the school from various sources. Reverend G. K. Dunlop, who visited the school sometime in the spring of 1873, had the following report: "For what is called a practical education, or what is generally known in colleges as a science course, I know of no school which offers equal advantages." Even more emphatic in its praise of the institution is a quotation from a Springfield, Missouri newspaper cited in the *ROLLA HERALD* on May 8, 1873: "Young men instead of emigrating eastward and becoming matriculated at some one of the moss-grown colleges of New

England—housed in a rickety dormitory, would find it more advantageous to spend the required four years at the School of Mines, an institution of learning so generously founded by the state of Missouri. . . .”

The standards to which the school had been elevated were further made public in the favorable report of a visitation committee of the Missouri General Assembly. This Committee on Mines and Mining inspected the school in January, 1875. Among the auspicious remarks throughout the entire report, the following was referred to for many years in the school catalog:

“We do not intend to eulogize this institution with high-sounding phrases, nor do we mean to underrate the difficulty that each undertaking meets with, during its incipient state, but with pride we acknowledge the unanimous opinion of your Committee that this school is highly worthy of the people of the great State of Missouri, and in full coincidence of the intent which led to its creation. We may look forward with well-founded hopes that by the practical workings of this school our dormant mineral wealth will meet the attention of the entire civilized world.”

As a result of this report and because of the insufficiency of revenues for operating expenses, the General Assembly in the spring of 1875, made an appropriation of \$10,000 for the biennium 1875-76. This was the first direct appropriation for the School of Mines and Metallurgy from the legislature.

The same session of the assembly also passed an act placing the State Geological Survey under the direction of the School of Mines. By the terms of the measure the curators were directed to elect a Professor of Geology for the school who would be ex-officio State Geologist. Because of the deepening of the economic depression, funds were not available for the new professorship; therefore, Williams was made the State Geologist and charged with operating the survey. The survey was not a success because of the lack of legislative support and it was later moved to Jefferson City. It was to be removed to Rolla at a later date.

After 1875, serious difficulties began to confront the institution. The phenomenal growth and success that had so marked the first three or four years could not continue. One indication of impending adversity was reflected in a declining enrollment. The enrollment figure of 101 for the 1874-75 term had diminished to seventy-one in 1875-76, and to only sixty-four during 1876-77. The basic problem was the panic of 1873, followed by a depression which, by 1875, was sorely sensed in Missouri. This depression had a tragic result on the struggling young school. For the School of Mines, the situation was even more distressing because of an inadequate endowment for revenue. The appropriations from the General Assembly were too meager for operating

expenses. The University Curators were embarrassed by the insufficient legislative allotments. Had it not been for the \$35,000 bond issue approved by the assembly in 1872, the school might have been forced to close its doors.

To Williams, who had striven so energetically to establish his excellent educational philosophies and to make the school one of the most conspicuous of the nation, the trend of affairs must have been distracting indeed. But to those who can look ahead, the very fact that he was capable of keeping the organization in operation was proof of his proficiency. It must also be remembered that it takes years of growth and tradition to develop outstanding institutions. Williams was attempting an almost impossible task, especially when outside elements intervened which were entirely beyond his control. Possibly it is an admirable trait for leaders to fix their objectives for high attainments, although they may never be achieved. It perhaps inspires one to achievements beyond the realm of the mediocre or the average.

Williams' contributions to the school's history reach far beyond the mere actuality that he was its first director. The founding of the school and the high standards initiated seemed to him perhaps obvious routine. He longed to see a school of national recognition. Nevertheless, Williams should have noted some of his paramount contributions. He established the fundamental principles for a broad scientific training so needed for specialization in engineering. The school by that date had a permanent building, a campus, and a distinguished faculty. Thirteen students had received regular degrees in the technical courses and seven certificates of proficiency had been granted. A total of 446 students had enrolled under his leadership. The high ideals which the first director founded were to "pave the way" for all his successors. Thus, in later history when Missouri School of Mines and Metallurgy prospered, its friends could look in retrospect to the scholarship, purposes, and unwavering faith of its first director, Charles Penrose Williams.

The Board of Curators in June, 1877, in acknowledgment of his services, adopted a resolution declaring its profound regret that C. P. Williams' resignation was tendered and expressed high appreciation of his learning, zeal, ability and efficiency.

ENROLLMENT—WILLIAMS ADMINISTRATION 1871 - 1877

	<i>Preparatory</i>	<i>Special</i>	<i>Technical</i>	<i>Total</i>
1871-72.....	17	3	8	28
1872-73.....	33	25	17	75
1873-74.....	54	29	24	107
1874-75.....	18	65	18	101
1875-76.....	19	31	21	71
1876-77.....	13	31	20	64

DEGREES—WILLIAMS ADMINISTRATION

1871 - 1877

BACHELOR OF SCIENCE DEGREES GRANTED BY INSTITUTION

	<i>Mining</i>	<i>Civil</i>	<i>Total</i>
1873-74.....	1	2	3
1874-75.....	1	1	2
1875-76.....	3	2	5
1876-77.....	2	1	3
	<hr/>	<hr/>	<hr/>
Totals.....	7	6	13

CHAPTER III

ELEVEN DIFFICULT YEARS

1877—1888

The resignation of Director Williams was a tremendous blow to the young institution already suffering from many adversities. The handicaps under which the school labored were not to be easily eradicated and there followed a period of stringency, uncertainty, and even factional strife, when the very existence of Missouri School of Mines seemed to hang in the balance. Many programs were initiated and plans discussed to overcome the obstacles and to inject new life into the institution. The high standards of scholarship and training, for which Williams had worked so diligently were not forgotten, even if they were not always maintained.

Although the progress of the school in this period was very disheartening to the friends and especially to local supporters in Rolla, its doors remained open and a foundation was laid upon which the modern School of Mines and Metallurgy was built. Perhaps the basic difficulties of the period were inevitable in the face of inadequate finances and the many tasks coincident with the operation of a school of technology in Missouri in this era.

When the second director, Charles Edmund Waite, assumed his duties in the fall of 1877, the future was anything but encouraging. The enrollment for the term 1877-78, hit the low figure of forty-three which was the smallest enrollment in the history of the school, with the exception of the opening year. This number included thirty-two from Phelps County, another evidence of the difficulty of attracting students from over the state at this crucial time. Eighteen of the enrollees were women from the local area. The succeeding terms, 1878-79, did register a gain to a total of seventy-one, but fifty of this number were from the surrounding community. Three were matriculated from outside Missouri with one each from Kentucky, Kansas, and Arkansas.

The study of the enrollment statistics of the Waite Administration reveals increases in enrollment for the years from 1880 to 1883, when 110 were recorded. An examination of the courses pursued by the students in 1883 discloses that a majority still were enrolled in the Preparatory or Special courses. It was an encouraging fact that five states outside of Missouri were represented with thirteen students; three students came from outside the United States, namely, from Mexico. Unfortunately the increase was to be only temporary, for after the top

figure of 110 for the 1882-1883 term, the totals fluctuated to only fifty in 1887-1888, the closing year of the Waite Administration.

The fact that only twenty of the fifty students enrolled in the 1887-88 term pursued the regular technical subjects was even more discouraging. In spite of the fact that a minority of the students elected the technical courses, this institution did serve a worthy purpose. A considerable number of those selecting the special or preparatory courses accepted positions of responsibility in the public schools and in the various professions in Missouri. No doubt they were able to live a more useful life as a result of their training at Missouri School of Mines, even though they did not receive a degree.

Beginning with the Waite term in 1877, numerous changes or experiments in the curricula were attempted. These curricular changes, which were in the direction of the liberal arts subjects, continued to about 1883. While there may have been a feeling that regular technical training should be broadened by the addition of humanistic studies, the more immediate cause for this trend was to attract students and thus combat the declining enrollment.

The catalog for 1877-78, in addition to the regular technical and preparatory departments had optional courses in bookkeeping listed for the first time. The courses in bookkeeping were divided into two classes: the first devoted all their time to the subject and were thus able to complete merchants' accounts, banking, railroading, and steamboating, in three months, or merchants' accounts could be completed in one month. The second class pursued bookkeeping in connection with any other study which they might elect, and the course extended throughout an entire year.

The optional course in addition to bookkeeping included a diversity of subjects which ranged from Ancient and Modern Foreign Languages to studies in Ornamental Drawing—paintings, water colors, and oil paintings. Also instruction in Architectural and Mechanical Drawing were included. These offerings were open to all students but required of none. This optional program was eliminated from the offering in 1883, largely as a result of opposition from certain members of the faculty and of the administration.

The expansionist trend in curricula had resulted in the offering of two courses for teachers beginning in the 1878-79 school year. Upon completion of these courses either a first- or a second-class certificate was granted. The offerings leading to a first-class certificate were so extensive and included so many subjects that two or even three years might be devoted to its completion. This course of study contained such subjects, as spelling, arithmetic, grammar, geography, physics, anatomy, botany, bookkeeping, history, astronomy, algebra, drawing,

and rhetoric, for the first term. The second term requirements were similar to the first except that logic, chemistry, and civil government were added. The mastery of these subjects should have made one thoroughly qualified both in the elementary field and on the high-school level. Obviously the only distinction in the program between the first and the second certificates was that the latter requirements called for a smaller number of courses. Such subjects as bookkeeping, astronomy, literature, physics, and chemistry were not required for the second-class certificate. All of the special curricula for teachers were discontinued in 1883.

In 1881-82 a four year girls' course in arts was given, but was offered only for the one year. This course provided an extremely wide variation of subject matter. The fourth-year requirements called for analytical geometry, descriptive geometry, Latin or Greek, German, French, Spanish, Medieval History, drawing in water colors and oil, calculus, chemistry, psychology, political economy, and a graduation thesis. An intellectual giant of today would stand in awe at such a program of study.

It was evident by the summer of 1883, that a difference of opinion had developed in regard to the fields of instruction which should be offered at Missouri School of Mines. Beginning in 1883, the so-called technical faculty began to take matters into its own hands and cut off the "frills." At the faculty meeting on April 14, 1883, both the girl's courses in arts and the work for the degree of Bachelor of Philosophy were stricken from the catalog. The two professors primarily responsible for the elimination of most of the liberal courses were G. Z. Whitney of the Mathematics Department and G. D. Emerson of the Civil and Mining Departments. No doubt they had the support of Director Waite, who by this time had become alarmed at the non-technical expansions. Further evidence that the technical group had taken control of affairs was revealed when, on October 13, 1883, the faculty voted to inform all those enrolled in optional classes that the regular work required for degrees must take precedence over all other.

In 1885, an act was passed by the state legislature requiring the Board of Curators to adopt a liberal academic course of study at the School of Mines leading to the degree of Master of Arts. This was later changed to the degree of Bachelor of Science (B.S.). The faculty at its first meeting in September, 1885, arranged the academic course of study. The course as outlined in the 1885-86 catalog included the following subjects:

FIRST YEAR

First Term

Arithmetic
Grammar and Word Analysis
United States History
Drawing

Second Term

Algebra
Composition and Rhetoric
Physical Geography
Physiology
Drawing

SECOND YEAR

First Term

Latin
Algebra
Geometry
Physics
Drawing

Second Term

Latin
Algebra
Geometry
Civil Government
Drawing

THIRD YEAR

First Term

Latin
Trigonometry
English Literature
Bookkeeping

Second Term

Latin
Land Surveying or Botany
Chemistry
Political Economy

This course was designed for the student who did not wish to enter the regular technical department, but who desired a more liberal education than was offered in the preparatory work. It especially appealed to young men desiring a business career, or to teachers preparing for advancements in their profession. Although the legislative provisions establishing the course made it possible for the school to grant a degree under this program, none was ever granted. Diplomas of graduation were, however, awarded.

The preparatory department, after a reorganization in 1883, was made into a two-year course of study. Furthermore, it became almost entirely a program to prepare one for entrance into the regular degree courses. In the first year about the only requirements that could be designated as liberal were United States history, composition and rhetoric, and physical geography. The second year was all specialized, with science and mathematics predominating. A mastery of the second-year subjects should have enabled a student to pursue successfully the regular technical course.

The technical department by the close of the Waite Administration carried work leading to two degrees, Civil Engineer (C.E.) and Mining Engineer (M.E.). A comparison of the requirements in Civil Engineering for 1886-87, with those during the Williams Administration show very few changes or new courses. Surveying had been moved into the second year, and the course in Mineralogy was no longer re-

quired in the Civil curriculum. New Civil requirements which appeared by 1886-87, were astronomy, steam engine, railroad location, and civil engineering design. The work in Mine Engineering shows very little change.

A problem, which seemed to have plagued the faculty in the early years of the Waite Régime, was the numerous student requests and petitions for excuses or releases from their studies. It was a very common practice for parents to request a release for their sons and daughters from some unpopular or difficult subject. The faculty, for example, in the fall of 1878, released a young lady from her courses in spelling, English grammar, and anatomy on account of weak eyes. At the same time another young lady was denied the right to discontinue her studies in spelling, rhetoric, and anatomy because the request was not signed by her parents. Although these petitions for release came before the faculty throughout an entire term, they were more numerous just prior to final examinations. Final examinations evidently were as unpopular in 1879 as they are today.

The faculty minute-book shows that parents frequently consented to their children's demands and signed petitions asking for excuses from final examinations. Before the term finals of January, 1879, the parent-student requests became so numerous that the faculty decided to take action on the problem. The faculty expressed a deep concern that parents would yield to such demands from their children. It was voted that students not specifically excused prior to an examination and who failed to appear for the examination would receive the grade of zero. In the case of those excused prior to the examination, no grade was to be recorded. In May, 1879, all petitions for excuse from final examinations were denied.

The system of discipline followed was a continuation of the policies laid down by Williams. While Waite was perhaps not as forceful or as strict in his disciplinary actions as Williams, he was above all concerned with the character-building of the student. Beginning in 1880, Waite and his faculty began to study the whole question of discipline and to suggest means of improving the past methods. As a means of publicly reproving those who violated the rules, at the close of each term a black list was reported. This included the names of students who had received demerits, unexcused absences, and tardies. This system of unfavorable publicity for the wayward and disobedient may have caused some to lead a more studious and competent academic life. The majority listed carried only a few demerits, many of which were unavoidable as in the case of tardiness. A few received an excessive number, as one student in the spring of 1878, had a total of 243 demerits with 110 absences and 21 tardies.

The lives of the students were still thoroughly investigated by the faculty. Some of the meetings involving disciplinary cases were long-drawn out proceedings. At a meeting on January 26, 1881, the faculty voted on methods for avoiding "such protracted meetings in the future." Waite was meticulously impartial with the students and if he saw that the object of a certain disciplinary action had been accomplished, he was ready to modify the form of punishment or even remove demerits. This was true if the student were willing to repent of his conduct and respect the rules of the school. In May, 1880, three students were given ten demerits each for laughing and creating a disturbance in the classroom. The faculty later removed the demerits, with the satisfaction that the object of the discipline had been accomplished.

A survey of the expenses entailed by the student for the 1886-87 term, is surprisingly meager when contrasted with the higher living-costs of later years. The Missouri School of Mines Catalog for that year published an estimated statement of the probable expense for a typical student for one year. The expense account was itemized as follows:

Tuition	\$20.00
Laboratory expenses	20.00
Board, fuel, washing, lights	96.00 to \$150
Books, stationery, etc.	8.00 to 20

The minimum estimate equalled \$144.00 per year; the maximum amounted to only \$210.00 annually. Many students earned a portion of their expenses by working at various jobs in the town. The parents were urged by the school administration, to give their sons and daughters very little spending money, as only a small sum was needed in that day. The school authorities might have reasoned that a student having an excessive amount of money would be more likely to neglect his studies and become a disciplinary problem.

One of the direct contributions of the Waite Administration was the construction of the Chemistry Laboratory, the second edifice built on the campus. As chemistry was the specialty of Waite, he was pre-eminently qualified for the task of supervising its construction. The need for a chemistry laboratory had been apparent since the beginning of the school. The disadvantages of the Rolla Building as a chemistry laboratory were poor lighting, inadequate room, and the lack of a system of ventilation to carry off the gases. In 1885, the Missouri General Assembly, in addition to the regular \$15,000 biennial appropriation for support and maintenance, added \$10,000 for the construction of a new Chemistry Laboratory at the school. Additional land lying to the south of the Rolla Building was purchased by the board in 1884. This extended the south end of the campus to Eleventh Street.

The construction of the new laboratory began in 1885, under the supervision of Director Waite. The building as then constructed was only a one-story structure and comprised the central portion. The wings and the second story of this building were constructed at a later date. The addition of the Chemistry Laboratory made the institution appear more like a school of technology, as it could boast of two halls of learning rather than only one. The 1886-87 bulletin described the new edifice as satisfactory in every respect. The facilities for securing heat, light, and ventilation were perfected and provision was made for carrying off foul and dangerous gases. The Board of Curators at a meeting in January, 1887, adopted a resolution extending words of appreciation to Waite for the able manner in which he planned and directed the erection of the laboratory. With its new equipment, the curators described it as the model edifice of its kind in the West, if not in the United States.

After eleven years of service as Director of Missouri School of Mines, Waite resigned July 1, 1888. He later received an appointment as Professor of Chemistry at the University of Tennessee, a position he held for over thirty years.

The period of the Waite Administration was perhaps the most difficult that the School of Mines has experienced in its history. It was not an elementary task to direct the administration of the school under such trying conditions. While his efforts to make the institution an outstanding school of science were as resolute and unshaken as those of Williams, he seems to have lacked certain qualities of administrative leadership so needed by the School of Mines in this period. Whatever may have been his deficiencies in the realm of administration, his courage, hard work, and undying devotion to duty won the respect of all, including President S. S. Laws and other university authorities.

Waite was possibly more proficient as a teacher and research chemist than in such phases of administration as publicity or the other procedures necessary in building up the enrollment. One may conclude that his teaching duties were too heavy to give him ample time for such diverse undertakings as building up favorable sentiment in the state legislature, contacts with engineering societies, speaking engagements, or other activities so necessary for the progress of the institution. But the very fact that he loyally steered the school through eleven difficult years has definitely registered his contributions to the history of Missouri School of Mines.

Charles Edmund Waite left the foundation upon which succeeding leaders were able to construct the modern School of Mines. In recognition of his faithful service the Board of Curators adopted a

resolution endorsing "his unremitting attention to duty, high efficiency, and charming courtesy."

ENROLLMENT

1877 - 1888

1877-78.....	43
1878-79.....	71
1879-80.....	71
1880-81.....	96
1881-82.....	82
1882-83.....	110
1883-84.....	71
1884-85.....	72
1885-86.....	46
1886-87.....	59
1887-88.....	50

DEGREES 1877-1888

	<i>Mining Engineering</i>	<i>Civil Engineering</i>	<i>Philosophy</i>	<i>Total</i>
1877-78.....	2	2	..	4
1878-79.....	1	1	..	2
1879-80.....	2	0	..	2
1880-81.....	1	1	..	2
1881-82.....	1	4	..	5
1882-83.....	0	1	..	1
1883-84.....	2	3	..	5
1884-85.....	2	1	..	3
1885-86.....	2	1	..	3
1886-87.....	2	2	..	4
1887-88.....	0	0	..	0
Totals.....	15	16	..	31

CHAPTER IV

DEVELOPMENT OF MODERN SCHOOL OF MINES AND METALLURGY

1888-1907

The period 1888 to 1907 marks the development of the school into a monumental institution, and into what some have described as the most outstanding School of Mines and Metallurgy in the entire nation. Especially after 1897, the school witnessed an era of expansion, prosperity, and growth, which Williams and the founders envisioned. Although the real development in this period came during the era from 1897 to 1907, many evidences of the modern School of Mines made their appearance before 1897.

Four directors served the school before the close of this period. The first of the group, William Holding Echols, administered the school's affairs from 1888 to 1891; the second director from 1891 to 1893 was Elmo Golightly Harris; Walter Buck Richards held the office from 1893 to 1897; and under the direction of George Edgar Ladd, who served from 1897 to 1907, the Missouri School of Mines and Metallurgy attained national and even world fame.

The director serving from 1888 to 1891, W. H. Echols, held the degree of Bachelor of Science and the degree of Civil Engineer from the University of Virginia. Echols first joined the School of Mines faculty in 1887 as Professor of Engineering and Graphics during the Waite Régime. When the latter resigned in the summer of 1888, Echols was recommended for the position and became director. In addition to his duties as director, he was Professor of Civil and Mining Engineering.

Elmo Golightly Harris, a native of South Carolina, received his academic training at the University of Virginia where he received the degree of Civil Engineer (C.E.). During the nine years prior to his appointment to the faculty of the School of Mines, Harris had won recognition as a civil engineer. At the time of his appointment he held a responsible position with a railroad company in the South.

The director immediately succeeding Harris, was W. B. Richards who was born at Riverton, Virginia. He received his Master of Arts degree from the University of Virginia in 1885. Richards resigned a teaching position at McCabe's University at Petersburg, Virginia, to accept the Chair of Mathematics at the School of Mines in 1888, upon recommendation of Director Echols. W. B. Richards served in this

position until the resignation of E. G. Harris, when he then assumed duties as director. The school advanced under his leadership.

During the Echols Administration the faculty consisted of the following: W. H. Seamon occupied the Chair of Analytical Chemistry and Metallurgy, left vacant by Waite; W. B. Richards was Professor and Head of the Mathematics Department; E. A. Drake and P. J. Wilkins directed the work of the academic department; and George Reginald Dean was listed as Instructor of Mathematics and Physics. Aside from a few years' absence in the 1890's, Dean served as Professor of Mathematics until his retirement in 1937.

The opening year of the Echols Régime brought a transformation in the listing of curricula. The curricula were divided into two major divisions, the academic and the technical. The technical work was sub-divided into four schools as follows: the School of Engineering, the School of Analytical Chemistry and Metallurgy, the School of Mineralogy and Geology, and the School of Mathematics. The word "school" designated what we would now enumerate as departments, and was used throughout the Echols Administration.

The major curricular innovation under Echols was the introduction of new degree courses in 1889 and 1890. In addition to the traditional work in the fields of Mining and Civil Engineering, it was possible to obtain a Bachelor of Science degree in Mechanical Engineering, Chemistry, Mathematics, Physics, and General Science. The first year requirements in mechanical engineering were practically the same as those in mining and civil engineering. The second year had many of the same requirements, except that mechanicals had to take work in statics and the kinematics of machinery. The third year carried such specialized mechanical subjects as mechanics of machines, theory of prime movers, and dynamics.

The subjects leading to the degree in General Science were of a broad and liberal character. The first year, similar to the typical freshman program in a liberal arts college, included such subjects as: higher algebra, geometry, history, French or German, and composition and rhetoric. The second year showed a greater stress on the technical side requiring trigonometry, analytic geometry, geology, physics, and physical geography. The student had the option of French or German. The last year was both scientific and liberal with chemistry, botany, zoology, astronomy, political economy, English literature, and a thesis, all required.

Certificates of Proficiency were conferred on those who passed examinations on any of the following special courses: geology and mineralogy, general chemistry, fire assaying, botany and zoology, elementary physics, geology, the academic, and the special course.

In 1891, three additional special courses were added in assaying, surveying, and electricity. The requisite for admission to any one of these subjects was a knowledge of the preparatory studies in that field.

The regular degree offerings as outlined above endured to the end of the Harris Administration in 1893, with the exception that the general science course was eliminated in 1891. The other degree programs remained intact until 1893-94, when the mechanical engineering program and the degree courses in mathematics and physics were discontinued. The elimination of the course in mechanical engineering was at the request of Director Richards in 1893. Richards gave as his reason for such action the fact that the necessary equipment had not been provided for such work.

Meanwhile, in 1892-93, under Harris' direction, curricular changes of far-reaching significance were instituted. First there was the abolition of the Preparatory Department which had been in existence since the beginning of the school. This was a policy advocated by President R. H. Jesse, of the University, for all university divisions as a means of elevating standards. By the decade of the 1890's, the secondary school had become a more universal institution. The second step of even greater significance for future developments was the extension of the regular technical courses into a four-year program. It has remained such to the present day. The third development of importance along with the introduction of the four-year technical course was the establishment of the English requirement. This marked the beginning of the freshman English requirement for all curricula. Another achievement of the Harris Administration was the appointment, in the fall of 1891 of the first permanent Professor of Physics. Dr. Austin L. McRae, who later became prominent in school activities and director of the institution was elected to this chair. E. G. Harris tendered his resignation as director in 1893, but continued to serve the school in the capacity of Professor of Civil Engineering until his retirement as Professor Emeritus in 1931.

A notable curricular advance during the Richards regime, 1893-97, was the creation of a new chair of Mining and Metallurgy. This, in the words of Richards in his report to the board, "will enable us to strengthen our courses in subjects belonging to that department." To this date Metallurgy had been affiliated with the Chemistry Department. For the 1894-95 school year, the curricula were divided into the following departments: Engineering, Chemistry, Mining and Metallurgy, Mathematics, Physics, and Modern Languages.

The period from 1888 to 1897 was momentous for the increasing emphasis on the technical phases of the school curricula. It was primarily an intensive rather than an extensive development. The work

in the humanistic studies came to be considered not as an end in itself, but more as an integrated phase of the regular engineering work. This trend was evidenced by the establishment of the English requirements for all degrees, and by the German course for chemistry majors. In summary, this two-fold curricula advance from 1888 to 1897, comprised an attempt to improve and expand the regular technical subjects so as to produce more thoroughly trained engineers; and to supplement these scientific fields with such cultural subjects as were considered necessary to prepare leaders, citizens, and educated gentlemen.

Enrollment statistics reveal slight increases over the period from 1888 to 1897. These gains were small however, when compared to the astounding increases of the Ladd Administration. The period opened with 65 students enrolled, followed by small annual increments until, in 1893-94, a maximum number of 121 was registered under Richards. This was the largest enrollment in the institution's history to that time.

Possibly of greater import than the mere increase in total enrollment was the growing number of technical students. This number increased from 33 in 1888-89, to 48 in 1893-94, and advanced to 69 in 1896-97. By the latter date, 69 of the 104 students were enrolled in the regular degree curricula. The elimination of the preparatory work, in addition to the increasing emphasis in the technical fields, was reflected in a declining number of women students. The number of female students diminished from 26 in 1888-89, and 35 in 1893-94, to a minimum of four for the 1896-97 term.

The widening geographical distribution of the students made it difficult for critics to specify that Missouri School of Mines was a Phelps County school. A close examination of the 104 students matriculated in 1896-97 determines that of the seventy-one Missouri students only twenty were from Rolla. Twenty-three students were enrolled from thirteen different states, and one each from Indian Territory and the territory of New Mexico. Eight students registered from outside the United States, including 6 from Mexico and two from Germany.

The low ratio of degrees to total enrollment, which had been characteristic since the first School of Mines commencement, continued into the Ladd term. For the whole era from 1874 to 1888, inclusive, only 45 had received Bachelor of Science degrees. No Bachelor of Science degrees were granted in 1888 or 1889, and only one, George Reginald Dean, received a degree in 1890. The number then increased from five in 1894, to eight in 1897. Daniel Cowan Jackling, who has often been mentioned as the greatest of Missouri School of Mines alumni, graduated in 1892.

The school was subjected to severe criticism for an exceedingly small number of graduates prior to 1897. In fact, for the twenty years following the first graduation exercise in 1874, an annual average of only three per year received degrees. A visitation committee, appointed by the governor of the state, made an inspection of the school in 1890-91. A possible answer to the critics of the school for its small number of graduates may be ascertained from the following report of this committee.

"To the criticism sometimes made on the school for not having a greater number of graduates each year, your committee deem it but just to say that, in our opinion, this is largely due to three facts; first, that the facilities have not been provided for a complete education in all the branches of scientific knowledge expected to be taught here, without more time, labor, and expense than the average student of limited means can afford; second, that work and proficiency alone are the touchstones to the success rewarded by diplomas from this school; third, that the demand for students who have not more than half finished the prescribed course required by this school before graduation, but who have become equipped for the work of surveyors and civil engineers to the extent that they command much greater wages than they could have done on entering the school, tempts many to make engagements that lead them away from the school before finishing the course, most of these students being of limited means."

Discipline continued to engage the serious attention of the faculty. The demerit system was enforced as late as 1889 for those disobeying the rules. One could now incur one hundred demerits before being expelled from school, while fifty brought a notification to the parent or guardian. As evidence that the faculty allotted larger numbers of demerits, in January, 1889, an unexcused absence from laboratory or field work, carried ten demerits; absence from lecture warranted five demerits; and two demerits were inflicted for each tardy. As examples of the punishment for general disobedience, a student in 1891 was given fifteen demerits for loitering on the steps of a building, and another received twenty-five for leaving town without permission as this constituted a more serious offense.

The faculty regulations on discipline applied to young ladies as well as to men. Regulations were approved in October, 1891, expressly prohibiting young ladies from loitering about the campus or halls of the buildings. To show that the faculty was serious in this matter, a short time later, three young ladies were each given ten demerits for loitering in the halls and on the campus. In September, 1891, five specific practices were enforced forbidding students:

1. To enter a billiard or drinking saloon upon any pretext whatever, or to use intoxicating drinks of any kind.
2. To engage in noisy and disorderly conduct about the buildings.

3. To smoke in the buildings or on the campus.
4. To leave town without the permission of the director.
5. To mar the buildings or furniture in any way.

Beginning with the Ladd Administration in 1897, disciplinary matters began to possess a less conspicuous place in faculty affairs. The declining emphasis on matters of discipline was possibly indicative of the elapse of the old order and of the evolution of the more modern School of Mines. The following reasons may be offered as suggestive of the declining faculty interest and control over the everyday life and conduct of the students: the business of the school authorities was to teach subject matter and to train engineers, and the private social life of the student was outside their realm of responsibility; the obvious tendency of the faculty to concern itself more with academic questions such as grades, graduation requirements, curricula, and student activities; and the change in the character of the students. The abolition of the Preparatory Department and the greater emphasis on regular technical work brought an older and perhaps more mature student; hence, there was less need for concern over discipline.

Throughout the entire period from 1888 to 1907, athletics made great strides forward. As early as 1891, an Athletic Association was organized among the students for the promotion of an interest in the various sports. Also, by this time, a field was enclosed and graded for athletic activities.

The Athletic Association held field day exercises for the benefit of those attending the 1892 commencement. The association entertained the commencement guests in the afternoon following the formal exercises in the morning. A large number of entries were made and many contests witnessed. One contestant threw the baseball 300 feet, and others made good records for broad-jump and running-jump. The events were concluded with a tennis contest.

The greatest single advance in the field of athletic activity was the beginning of intercollegiate athletic competition. These intercollegiate contests were held before the school had a well-organized athletic department or a full-time athletic director. In fact, it was not until after 1907, that Missouri School of Mines had a full-time director or instructor in physical education; nevertheless, intercollegiate rivalry began as early as 1893. The control of these early teams was almost entirely in the hands of students who directed the Athletic Association. By 1907, this was officially known as the Missouri School of Mines Athletic Association. It was made up of a physical director, a board of control, and a captain and manager for each football, baseball, and track team. The only faculty representative was on the board of control. The faculty member who was one of the early promoters

of intercollegiate athletics at the school was Professor A. L. McRae. He devoted an unusual amount of time and energy to all sports and did much toward placing athletics on a permanent foundation.

While the association served a worthy purpose in creating an interest in athletics and in initiating participation in intercollegiate contests, its organization enabled certain student groups to dominate an activity to the exclusion of others. The fact that so many individuals had a voice in operating the teams, often resulted in embarrassment and disputes in the actual course of competition.

Intercollegiate rivalry began with the game of football. The first such game in the history of the school was played with Drury College, at Springfield, Missouri, in the fall of 1893. The expenses of the fifteen men making the trip were paid by the home team. From the reports of this first Miner contest given in the *ROLLA HERALD*, the day must have been very disagreeable and the field very muddy. Drury was victorious in this game, but from the *HERALD* reports the Miners had the experience of only two weeks of practice. It is interesting to note that Harry K. Landis, Professor of Mining and Metallurgy, played right-end in this game. There seems to have been no objection to coaches or members of the faculty playing in these early contests. The game with Drury was the only intercollegiate contest played that year.

In 1894, the Drury rivalry was the only scheduled competition, and this affray was won by the Miners by an 8 to 6 score. There were no games scheduled for the following year, but in 1896, competition with Drury College was renewed. On November 5, 1898, the Miners played their first game in St. Louis, with Washington University. The St. Louis newspapers described the event as one that would decide the state championship. An interest in the game was evidenced by reports that some 2,000 ladies and gentlemen attended. The Miners lost in their first appearance in St. Louis.

According to an article by McRae published in the *MISSOURI MINER*, the first full schedule of football games was played in the fall of 1900. The schedule included games with Marion Sims College, Missouri University, Kirksville Osteopaths, Drury, Washington University and St. Louis University. The team lost only to Kirksville and Missouri University that year. The most outstanding of the early football teams was evidently that of 1904. It won the intercollegiate championship of the state and closed its season with a glorious triumph of 54 to 0 over Arkansas University.

Baseball and track were likewise early competitive intercollegiate sports. Professor L. E. Garrett took an active interest in track and directed some of the early teams. It is reported that in the spring

of 1905, he turned out the best track team that the school had produced to that time. This team competed against the University of Kansas.

The most obvious handicaps of the early development of intercollegiate athletics were the problems of financing. In the early years, there was manifest opposition to the spending of school money for such purposes. It was reported that as late as 1897, the Executive Committee of the Board of Curators in donating \$100 for athletics, specifically prohibited the use of any of the sum for football. Therefore, money was raised by various other methods. An article in the *ROLLA HERALD* on October 27, 1898, called on the people of the town to help the M. S. M. Football team by attending a concert. In some instances the more simple procedure of just "passing the hat," among the student body and faculty, was utilized to provide funds for the purchase of uniforms and to pay travelling expenses of teams. After 1900, the coach was recompensed from these gifts and funds raised from benefit affairs. In 1906, Emory Wishon, student manager of the football team, made \$200 by staging a street fair and various types of shows.

Meanwhile, it became more and more difficult to finance the program, meet the expense of athletic trips, pay the coach, and arrange suitable schedules. Finally, in July, 1907, the Board of Curators created the office of Director of Athletics for Missouri School of Mines, with the salary to be paid by the state. The real development of athletics under the new program came with the appointment of F. E. Dennie as Athletic Director in 1909, but this account belongs to the succeeding chapter, which will tell of the school's activities and advancements under Director Young.

During the period from 1888 to 1897, two additions were made to the physical plant. The first of these, the student Mess Club and Dormitory, was constructed in 1889, as consequence of an appropriation of \$5,000. This building, when completed, contained what was described as "commodious and comfortable rooms for thirty young men." The dining hall and the culinary department were said to accommodate twice that number. At the beginning of each year the students formed a "mess club," managed by a committee of their own group. No charge was made for room rent, and the cost of board varied from \$12.00 per month for the 1893-94 term, to \$13.00 for 1894-95. Beginning in 1895, the dormitory was conducted as a rooming house only, and the students ate their meals elsewhere. In 1900, the State Geological Survey was again established at Rolla and was housed in this building. Since 1905, the building has been used as the residence of the Director.

The Mining and Metallurgy building was constructed and furnished in 1895, at a cost of \$25,000. The building was equipped for a practical course in ore concentration, roasting, and reduction. The geological and mineralogical equipment was placed in this building. The collection was augmented by the acquisition of the entire Missouri Mineral Exhibit, which was on display at Chicago World's Fair in 1893.

An appropriation of \$3,500 from the legislature in 1895, terminated in vast improvements of the campus and grounds. The entire campus was graded, and a low stone wall, surmounted by an iron fence, was constructed along the southern and eastern sides. The remarkable improvement in the general appearance of the campus may be noted by an inspection of the 1896-97 school catalog, when compared with the catalog for 1895-96.

For the ten-year period from 1897-1907, Missouri School of Mines was administered by one of the most dynamic and forceful directors in its history. This director, who so skillfully and courageously steered the school's progress in this important era, was George Edgar Ladd. Ladd was a New Englander by birth and a graduate of Harvard University, having been granted the Ph.D. degree from that institution in 1894. From the time of graduation until his appointment as Director at Rolla, Ladd's experience included work in geology for various states and for the Federal Government. At the time of his appointment as Director of the School of Mines, he was associated with the Geological Survey of the State of Georgia.

Ladd began his duties with such vigor and energy that the school almost immediately took on new life. He was soon dominant over all phases of school activities. Ladd's ambition was to make the school one of the great, if not the greatest, institution of science in the nation. With such a "new deal" initiated under the vigorous leadership of this director, it is hardly surprising that an outstanding School of Mines and Metallurgy emerged. The success attained by Ladd soon found expression in newspaper editorials, speeches of state legislators, reports of visitation committees, and from many other sources.

The following report of the Visitation Committee of 1905, is quoted because it is rather typical of the laudatory remarks which Ladd and the school were receiving from all over the state:

"Under splendid management this institution has become one of the largest and has reached the highest standards of excellence of any school of its character in the United States. We take pleasure in quoting and endorsing the following from the report of the last Visiting Committee: "President Ladd has raised the school to its proper position, and today it has perhaps the largest attendance of Mining and Metallurgical students of any school in the United States. The best proof of the excellent standing

of the school at the present time is that its graduates are sought in mining districts all over the world. It may prove interesting to know that the bridge over the Harlem River, said to be the largest draw-bridge span in the world, was designed by a graduate of this school; further, the largest chlorination plant for the treatment of gold ores, and the largest cyander plans in the world were designed by students of the Rolla School. . . . We do not feel that this report would be complete without saying that, in our judgment, we believe that the firm and broad foundation upon which this school now seems to rest, and the splendid reputation that it has attained abroad is due in no small degree to the wise, patient, industrious, and conscious work of its present director, Dr. G. E. Ladd."

Ladd was not only gifted as an administrator, a promoter, and a builder, but he likewise had a magnetic personality. He was able to win friends for the school from all over the state. Factional groups disbanded under his inspiring leadership and all worked toward the progress of the cause. Ladd's work received national recognition and the School of Mines became one of the most noted schools of its kind in the United States.

One of the first tasks that Ladd considered as essential was the construction of needed buildings to keep pace with school expansion. He was perfectly aware of the need for publicity and the establishment of contacts with the state legislature. He laid before the assembly the necessity for increased appropriations not only for maintenance but for badly needed buildings. The success of his efforts may be noted by the remarkable results attained.

The growing friendship and interest displayed by the Missouri General Assembly was an astounding factor in itself. Since the first appropriation of \$10,000 for the 1875-76 biennium, the average legislative allotments for support and maintenance to 1899, had been only about \$15,000 for each biennium. After 1899, the state assembly adopted the most generous policy toward the school in its history. Beginning with the \$22,000 appropriation for 1899-1900, the legislative allotments for support and maintenance had increased to \$40,000 for 1903-04 biennium.

Even more astounding was the generous support which the legislature gave to the Ladd campaign for more plant facilities. As a result of the legislative appropriations, the school campus began to assume more nearly its present form. In 1901, the assembly appropriated a total of \$74,000 for the erection of two new edifices and for the enlargement and remodeling of another. This fund made possible the construction of Mechanical Hall in 1902, Norwood Hall in 1903, and the second story and wings to the Chemistry Building. In addition to the above fund, \$13,000 was expended for new equipment in the power plant.

The first appropriation of \$50,000 for the construction of the main building, later called Norwood Hall, was not sufficient for its completion; consequently, additional funds were granted, and the Board of Visitors estimated the total cost of this important structure as \$92,312.46. Meanwhile, the Mining and Metallurgy Building had become totally inadequate and according to a visiting board was "unsafe." The legislature, sensing the above need, appropriated the first sum in 1905, for the construction of an ore-dressing building. The first sum was not sufficient and requisite funds were provided by the next legislative session. This badly needed structure was opened for use by the spring of 1908, although it was not entirely completed until 1911.

These additional buildings including the construction of sidewalks, gave the campus an improved appearance. By the close of the Ladd Administration the physical plant had expanded to eight brick structures and two temporary frame buildings. The two latter edifices were constructed to meet the needs of the growing enrollment: one was the workshop and dynamo laboratory and the other was the temporary gymnasium. These temporary buildings were constructed about 1899. The campus then extended eastward to Pine Street, and had assumed more nearly its present form.

The physical expansion of Missouri School of Mines from 1897 to 1907, was accompanied by a phenomenal increase in enrollment. Even more remarkable than the growth in numbers was the growing national and international distribution of students. The opening year of the Ladd Régime registered a total enrollment of 117. There followed an annual increase, until by the year 1904, the total of 224 had been reached. Whereas, twelve states outside of Missouri were represented in 1897, this number had grown to twenty-nine by 1904. The 1897 figure shows eight students from two foreign countries, namely, Germany and Mexico. By the 1904-05 term, a total of twenty students were matriculated from eight foreign countries. The foreign nations represented were Austria, China, Japan, Mexico, New Zealand, Trinidad, Russia, and Sweden. There were enrollees from thirty-five Missouri counties and thirty from the city of St. Louis. The conclusion that the Missouri School of Mines had become an institution of national and even international recognition is clearly revealed.

The Ladd Administration was notable for a general elevation of standards both in regard to entrance requirements and to the regular technical work leading to a degree. At one of the first faculty meetings, Ladd appointed special committees to study the propriety of raising the standards of admission. One of the committees corresponded with the high-school principals of the state, with the ultimate end of

elevating the school's admission requirements. As early as 1893, under Richards, the practice of listing approved high schools whose graduates were admitted without examination, was initiated. This trend toward more thorough requirements for admission was continued under Ladd. By the close of Ladd's directorship, applicants were required to present a diploma of graduation from an accredited high school or successfully pass an examination in fourteen units of secondary courses. Thus all applicants had to possess a high school certificate or its equivalent.

With the increasing emphasis upon the regular professional work, there was also an attempt to adopt a more rigid program for special students. Beginning in the fall of 1901, they were required to state the reasons why they were not taking the regular course and they were further required to do good work in the subjects elected. Hence, the number enrolling as special students declined from twenty in 1897, to fifteen in 1907, when over the same period the total enrollment had increased from 117 to 210.

In the fall of 1898, a four-year course leading to a Bachelor degree in General Science was introduced. This course provided for work in history, English, foreign language, and biology, in addition to mathematics and physical science. The entire senior year was elective. Its basic objective was to provide for a liberal education in general science. This curriculum was designed to take the place of the three-year academic course beginning in the fall of 1900. The regular academic course was thus dropped in June, 1900, but the general science curriculum has existed to the present.

From 1898 to the close of the Ladd Régime, four regular courses were offered leading to degrees. The first, Mining Engineering, trained the student in all mining operations from the time of prospecting to the delivery of the finished product. The second, Metallurgy and Chemistry, specialized in processes subsequent to the delivery of the ore above ground. The third, Civil Engineering, specialized in railways, highways, and municipal works. The fourth, was the General Science course.

A course in Mining was added to the list of special courses in 1898. These special courses included chemistry and assaying, mining, surveying, and electricity. Most of these required two years for their completion, except surveying, which could be finished in one year and a term.

The general trend of curricular developments over the Ladd Régime, was toward a greater degree of specialization. This tendency was apparent by the introduction of new courses, designed to give the graduate a more thorough training to meet the new problems facing the engineer. An increasing emphasis was placed upon a knowledge

of electricity. The growing complex problems of engineering had resulted in the addition of courses to prepare the graduate in the solution of them.

Departmental organization by 1907, so closely resembled the present-day set-up, that its division is worthy of our attention. The following were listed as departments: Mathematics, Chemistry, Physics, Civil Engineering, Mining Engineering, Geology and Mineralogy, Metallurgy, Drawing and Designing, Shop Practice, English and Modern Languages. Aside from additional departments, the above division of subject matter is essentially the one in operation today.

The growing enrollment of the period from 1897 to 1907, was happily reflected in an increasing number of graduates. From 1888 to 1897 inclusive, only thirty-five Bachelor of Science degrees had been awarded. This was completely eclipsed during the Ladd period when a total of 157 Bachelor degrees were granted. During the last five commencements from 1903 to 1907, inclusive, 101 bachelor degrees were granted. At last one of the major criticisms of the school, its small number of graduates, had now been removed.

The library as an essential aid to instruction kept pace with the general progress of the institution. From a reported 2,100 volumes in 1889, the number had increased to 3,000 in 1893, to 3,700 in 1896, and finally to approximately 6,000 by 1906. Although no data are available on circulation, it seems that the library was being administered and planned more effectively for the everyday use of the student. Quite remarkable was the magazine subscription list which in 1906, amounted to seventy-two periodicals. Five newspapers were included in the subscriptions.

In the fall of 1905, the Library was moved from the old Rolla Building to the first floor of Norwood Hall. Here a room was equipped with steel stacks adjacent to the reading room. Beginning in 1906, the books were cataloged according to the Dewey Decimal System. Much of the progress in this new library was stimulated in 1905, by a state appropriation of \$3,500.

Literary Societies were still flourishing at the school during the 1890's, although after 1900, oratory, debate, and declamation had lost much of their earlier appeal. Perhaps the growing emphasis on the technical subjects and the declining number of special and academic students accounts for the waning interest in declamation, speech, and the art of expression. The general tendency after 1900, was for such literary societies as the Philo and the Alpha to be replaced by the professional societies and social organizations.

The Mining Club was an active organization as early as 1893. It met every two weeks to discuss questions related to mining and

metallurgy. In 1895, the name of the organization was changed to the Missouri Mining Club and later to Missouri Mining Association. An Electric Club met fort-nightly to meditate on the wonders of electricity. By 1895, an Engineers Club had been formed with a constitution and a set of by-laws. The fundamental objective as stated in the preamble was to promote an interest in practical engineering. It is an interesting commentary that one of the greatest of Missouri School of Mines Alumni, Allen P. Green, was an officer in this organization. A Journal Club was likewise in existence before 1900, devoting itself to a critical study of articles on chemistry in the various professional periodicals.

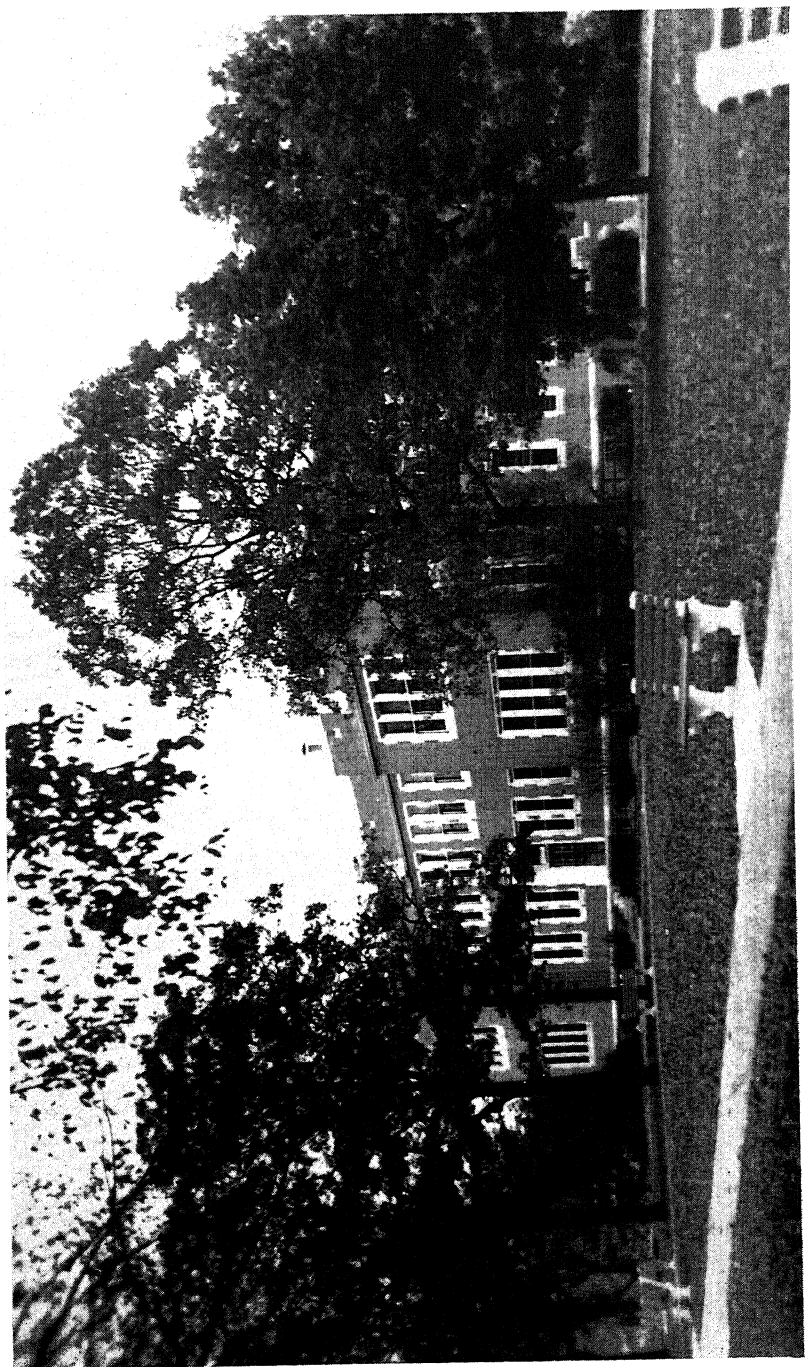
Shortly after 1900, an orchestra, glee club, and mandolin clubs were active organizations. An International Club in 1907, had a membership of twelve with representatives from India, Russia, Mexico, Sweden, the Philippines, Chile, and Japan. The Y.M.C.A. sought to develop the spiritual and social side of student life. It held a regular weekly meeting with lectures on popular subjects and on religious topics. After the program the members participated in boxing, wrestling, games, and other activities. By 1906, it boasted an active and associate membership of forty-five.

Beginning in 1902, there was organized the first of the so-called eating clubs, the Grubstakers. This was soon followed by the Lucky Strike and the R-Way Clubs. Some of these later emerged as fraternities while others disbanded.

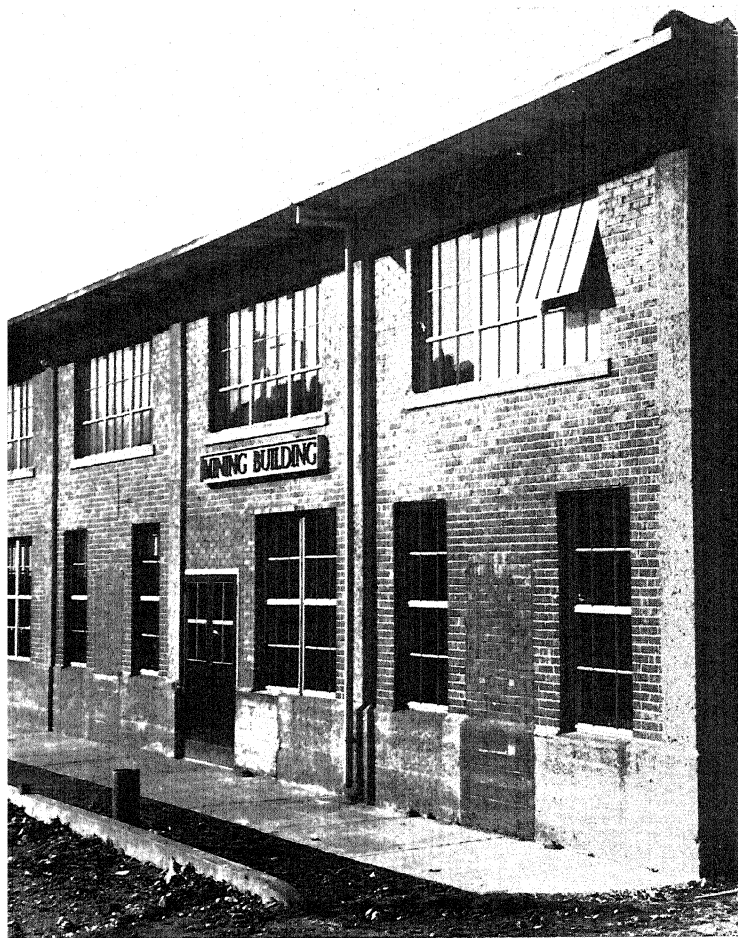
The history of fraternities at Missouri School of Mines dates from 1903. The first of these was the Gamma Chi of Sigma Nu, which was installed January 23, 1903. Beta Alpha of Kappa Alpha was instituted April 27, 1903, and on December 19, 1903, Beta Chi of Kappa Sigma was initiated. Then on December 2, 1905, came the installation of Pi Kappa Alpha. During the last year of the Ladd term the first honorary engineering fraternity was established. This was Tau Beta Pi, officially organized December 21, 1906.

As a fitting climax to the eventful Ladd Administration there was published, in the spring of 1907, the first issue of the *ROLLAMO*. This initial school annual was dedicated to Director Ladd. The organization, the financing, and the publication of this first *ROLLAMO* was accomplished only as a result of efficient work and thorough planning. D. C. Jackling generously aided the project by a gift of \$100. The initiation of the school annual made it possible to present a complete survey of school activities, athletics, and the general conditions of the school for a particular year. This made it possible for the graduate to return to his school days with pleasant memories. It likewise added materially to the school spirit.

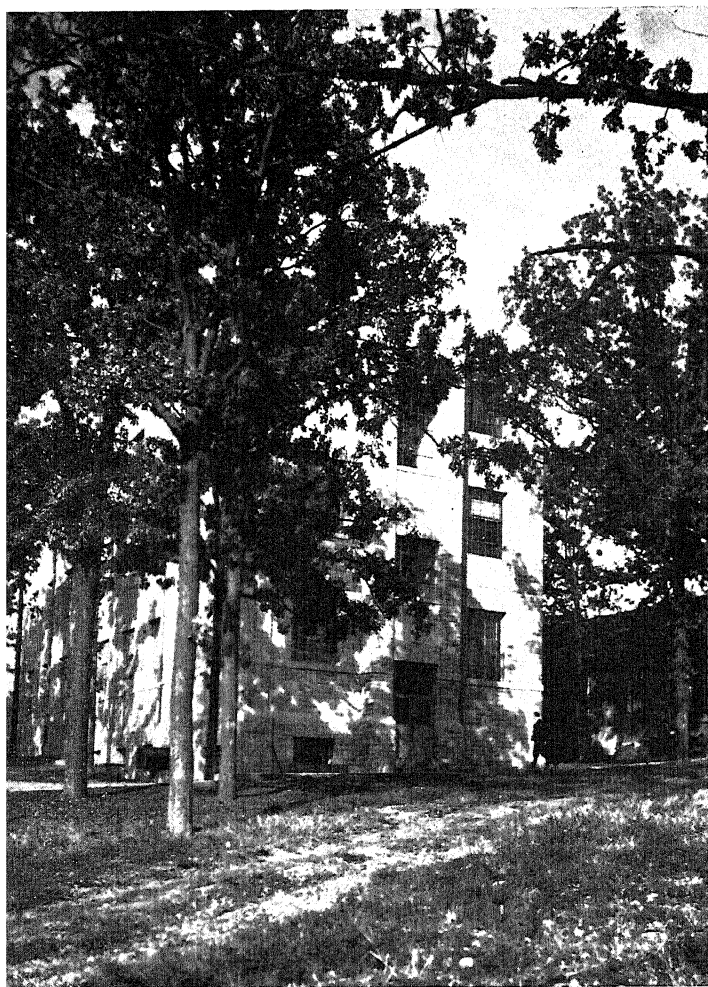
The institution's financial status was materially enhanced by 1907, as a result of three legislative acts. By an act of Congress approved



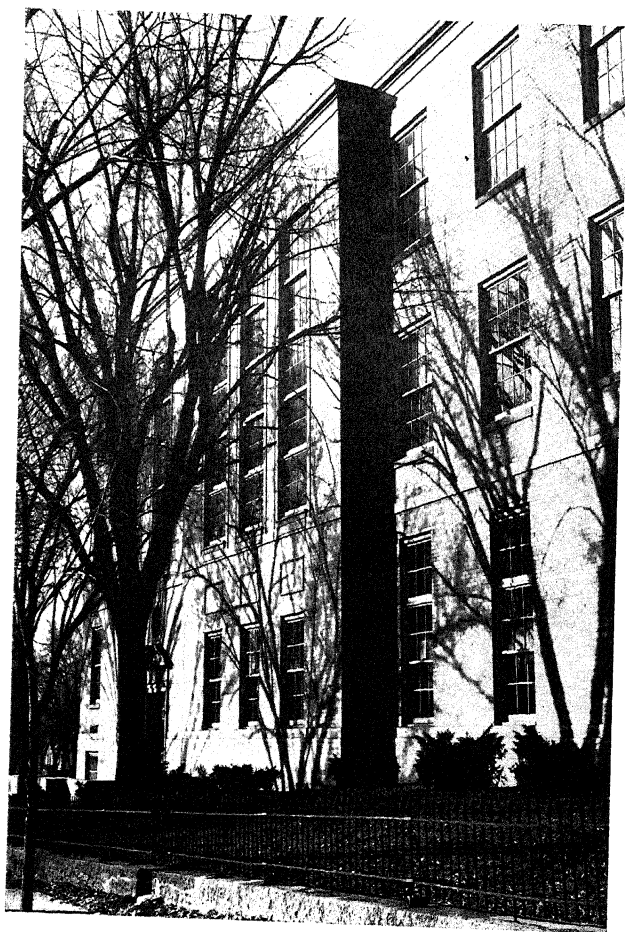
EXPERIMENT STATION BUILDING



MINING BUILDING



HARRIS HALL



NEW CHEMISTRY BUILDING

in 1890, commonly known as the "Morrill Bill", the Federal Government donated to each state operating a college under the original Morrill Act, \$25,000 a year. After a deduction of one-sixteenth of the fund for Lincoln Institute, one-fourth of the remainder was granted to the School of Mines. In 1891, the national government returned to the states all sums that had been collected by a direct tax during the Civil War. This was established as a permanent endowment for the State University, and the School of Mines received one-fifth of the income from this amount. The third act was a measure passed in 1901, by the state, known as the collateral inheritance tax law. This law levied a tax of five per cent of all collateral inheritances for the benefit of the university. By virtue of the state statutes, one-fifth of the sum was appropriated to the School of Mines.

In 1907, Ladd resigned as director of the institution, which under his leadership, had won national and international renown. It had been his privilege to direct the school through the most prosperous era in its history to that date. He witnessed the emergence of the modern School of Mines and Metallurgy. He must have left the institution with a feeling of pride and satisfaction that the goals fixed at the beginning of his administration had been accomplished. Thus concluded the most conspicuous and effective directorship in the first thirty-six years of Missouri School of Mines and Metallurgy history.

DEGREES GRANTED 1888-1907

	<i>Mining</i>	<i>Civil</i>	<i>B.S. in Chemistry</i>	<i>Gen. Science</i>	<i>Total</i>
1888-89 .....	..	..	..	..	0
1889-90	1	..	..	..	0
1890-91	1	..	1	2	4
1891-92	1	1	2	..	4
1892-93	2	1	..	..	3
1893-94	1	2	..	2	5
1894-95	2	3	2	..	7
1895-96	2	..	..	..	2
1896-97	4	3	1	..	8
1897-98	1	3	1	..	5
1898-99	5	4	3	1	13
1899-1900.....	7	..	..	2	9
1900-01	9	3	1	3	16
1901-02	10	1	1	1	13
1902-03	11	4	..	..	15
1903-04	16	..	2	..	18
1904-05	21	2	1	..	24
1905-06	18	4	1	..	23
1906-07	12	3	5	1	21
Totals.....	123	35	21	12	191

ENROLLMENT

1888 - 1907

1888-89.....	65
1889-90.....	69
1890-91.....	80
1891-92.....	83
1892-93.....	116
1893-94.....	121
1894-95.....	96
1895-96.....	72
1896-97.....	104
1897-98.....	117
1898-99.....	125
1899-1900.....	168
1900-01.....	177
1901-02.....	192
1902-03.....	209
1903-04.....	194
1904-05.....	224
1905-06.....	215
1906-07.....	210

CHAPTER V

PERIOD OF CONTINUED GROWTH AND SERVICE 1907 - 1920

The progress of Missouri School of Mines, which had been so apparent during the Ladd regime, was continued under the leadership of the four directors who served from 1907 to 1920. The first director of the period, Lewis Emmanuel Young, held degrees from Pennsylvania State College and from Iowa State College. He had received experience both in the fields of pedagogy and as a practicing engineer. Before coming to the School of Mines, he had held teaching positions at Iowa State College and at Colorado School of Mines. Young assumed duties as Director of Missouri School of Mines in the fall of 1907, and served until the summer of 1913, when his resignation was accepted. Under his direction the school witnessed continual growth and high standards of scholarship were maintained.

The second director, Leon Ellis Garrett, was a graduate of Missouri School of Mines, of the class of 1901. After serving as Assistant in Mathematics from 1901 to 1903, he had worked his way upward to the rank of Associate Professor of Mathematics before his appointment as director. When Young resigned in June, 1913, Garrett was elected acting director of the institution, a position he held to December, 1914, when Durward Copeland assumed duties of the office.

Copeland was a graduate of the Massachusetts Institute of Technology with the Bachelor of Science degree in Mining and Metallurgy. He came to the school as Professor of Metallurgy and Ore Dressing, a position he held since 1907. He served for only four months as Director and resigned in April, 1915. Austin Lee McRae was then appointed Director and held the office until July, 1920, a five-year term. He was first affiliated with the School of Mines from 1891 to 1894, as Professor of Physics. After eight years at the University of Texas and as Consulting Engineer for the City of St. Louis, he returned to the school in 1899, as Head of the Physics department. McRae held the Doctor of Science degree from Harvard University.

Three important additions were made to the physical plant during the 1907-1920 period. Two of these structures were completed under the Young Administration and the other during McRae's term. The first of these, the Ore Dressing building, had been in use since January, 1908, but not until 1911, was the structure completed. The second building constructed was Parker Hall, the future administrative center of the school. The edifice was named in honor of Luman Frank Parker,

a life-long friend and supporter of the school. The cornerstone of this central structure was laid on October 24, 1911, commemorating the fortieth anniversary of the founding of the school. This two-story, fire-proof gray press brick building was completed in 1912. It was to contain the offices of administration, the headquarters of the Y.M.C.A., and an auditorium with a seating capacity for 650, all on the main floor. The second story was equipped for the library, which was supposed to render space for 50,000 volumes.

The last addition to the physical plant was the erection of Jackling Gymnasium in 1915. This building was made possible with an appropriation of \$75,000 by the Forty-Seventh General Assembly. It was situated at the north end of the campus, adjacent to Jackling Athletic Field.

The Fortieth Anniversary of Missouri School of Mines was observed in an appropriate ceremony on October 24, 1911. As was noted above, this anniversary was celebrated in connection with the laying of the cornerstone of Parker Hall. Addresses were delivered by state officials, alumni, representatives of engineering societies, and other important personages. The Parker Memorial address was delivered by the Honorable David R. Francis, former Governor of Missouri. The cornerstone was laid by Arch A. Johnson, Grand Master of A. F. and A. M. of Missouri. Congratulatory remarks were given by Gustavus A. Duncan, one of the school's first graduates. A history of the School of Mines was read by Thomas L. Rubey, a member of Congress and formerly a teacher at the school. Walter Williams, Dean of the School of Journalism of the University of Missouri brought congratulations from the departments at Columbia. John Priest Greene, President of William Jewell College, expressed greetings from Missouri colleges. Short addresses were given by W. P. Evans, Superintendent of Public Schools of Missouri; John L. Harrington, Consulting Engineer of Kansas City; Erasmus Hayworth, President of State Mining Schools; William Rowland Cox, on behalf of Mining Fraternities; and William Coleman Bitting discussed the value of technical education.

After the exercises, a football game was played between Central College and the School of Mines. The important occasion closed in the evening, with a reception at Mechanical Hall in honor of the guests. This marked the Fortieth Anniversary celebration for the Missouri School of Mines.

The history of this institution during the period is conspicuous for the continued expansion of curricula to meet the growing complexities of the industrial age. In 1908, the Mining course carried three options, which the student could pursue during the senior year. Instead of the regular work in mining, a student who had satisfactorily

completed the first three years' work might elect one of the three options in Mining Geology, Mining Machinery, or Ore Dressing. By 1915, the senior Mining curricula were arranged so as to make it possible to specialize in the following: metal mining; coal mining; mining geology; mining, metallurgy, and ore dressing; mining machinery; and mining. The regular degree courses, in addition to the work in mining, included the Bachelor of Science in Metallurgy, Civil Engineering, and General Science. This offering constituted the basic curricula of the school from 1908 to 1916.

Beginning in the fall of 1916, work leading to the Bachelor of Science degree in Mechanical, Electrical, and Chemical Engineering, was given at the School of Mines. These courses had been added by virtue of a legislative act sustained by a Supreme Court decision. They reflected the increasing specialization in the field of engineering in response to the revolutionary industrial changes of the 20th Century. The enrollment in the Mechanical and Electrical curricula remained small until after 1920, varying from three to six students in each department. Chemical Engineering attracted more students from the beginning, increasing from eleven in 1916, to twenty-six for 1920.

The professional degrees of Engineer of Mines, Metallurgical Engineer, and Civil Engineer were conferred throughout the period. A degree of Chemical Engineer was conferred in 1917, but no professional degrees were awarded in Mechanical or Electrical Engineering until after 1920. These were conferred on graduates in the various curricula who submitted satisfactory theses based upon a professional experience of at least three years. Five years of experience were required for those in lines of work other than that in which he received his college training. The degrees of Engineer of Mines and Metallurgical Engineer, were also conferred on those holding Bachelor degrees in the respective fields who successfully completed one year of post-graduate work in residence.

Masters of Science degrees were awarded only in the General Science curricula before 1920. From 1900 to 1920, eight such degrees were conferred by the institution. After 1919, the Master of Science degree was conferred upon graduates in all curricula who completed one year of post-graduate work in residence, who also demonstrated ability in research, and who presented an acceptable thesis. Four such degrees were granted in 1920, with two each in Metallurgy and Chemical Engineering.

The special short courses in chemistry and assaying, mining, surveying, and electricity, were continued to 1920. They attracted those students who were unable to take the full four-year program. In the fall of 1920, this program was eliminated from the curricula.

The faculty of the school adopted a more modern grading system in 1915. In lieu of the grades E, G, P, D, and F, the marks of E, S, M, I, and F, were substituted. The latter system is still in use today. The students with marks of E and S were given additional credit above the number of hours as listed for a course. Those with a grade of M received the exact credit as listed for a course; whereas, those receiving an I were given only 80 per cent of the normal credit.

Enrollment statistics from the beginning of the Young Administration to the First World War show a more or less steady trend. In fact, the 254 students enrolled at the opening of the period was the largest registration figure until 1914. Beginning in 1914, a small annual increase occurred until it was temporarily deflected by the First World War. Following the war the enrollment immediately began to increase. The fall of 1919, brought the largest student-body in the history of the school, when 393 were matriculated. The war stimulated an interest in engineering and, hence, reacted in an increase in college enrollments. Also the Federal Government instituted a program of vocational education which further swelled the number of students in technical institutions.

Mining Engineering led the list in number of enrollees from 1916 to 1920, with a total of 468. The second choice of specialization was Metallurgy with 120 students. Third on the list came Civils with 92 patrons for the period. The other fields came in the following order: General Science, Mechanical Engineering, and Electrical Engineering.

More encouraging than the enrollment data was the increasing number of students remaining to earn degrees. Although the figures for the 1908-1920 era did not equalize those for the 1920's they were inspiring when compared to the totals before 1900. The number earning Bachelor degrees averaged thirty-one for the 1908-1920 years inclusive, and the total granted reached 403. This progressive trend may appear more significant when compared to the annual average of fifteen for the Ladd era, and of only about four for the first twenty-seven years of the school.

The increasing ratio of degrees awarded to total enrollment may be attributed to several factors. One factor perhaps was the premium given by industry to those holding degrees. Industrial executives were beginning to demand a more thoroughly trained engineer than had been the practice before 1900. Students found that it paid dividends to remain in school and earn degrees. Then there was the factor of prestige in being a college graduate which, was possibly of some importance. A third point, as stated by Professor S. H. Lloyd in his brief history of the School of Mines, was that "a larger part of the incoming students were from families of more means."

The 1907-20 period was notable in that several professors, who later brought distinction to the school, began their services for the institution. F. E. Dennie came to the school in the fall of 1909, as Instructor in Physical Education. He is today Associate Professor of Mathematics. J. W. Barley began his career with the school, in the fall of 1912, as Assistant Professor of English and Modern Languages. He served as head of the English department until his retirement in 1943. Others at present affiliated with the institution, who began their employment before 1920, include: Charles Y. Clayton, Professor of Metallurgical Engineering; Floyd H. Frame, Professor of Electrical Engineering; Leon E. Woodman, Professor of Physics; and Garrett A. Muilenburg, Professor of Geology and Mineralogy. Those teachers who began their services in this same era but who are since deceased are: Charles L. Dake, E. L. Johnson, H. T. Mann, and V. B. Hinsch. Space does not permit the inclusion of names of other teachers who left the institution for service in other fields and colleges.

A tradition that has been paramount in the fostering of school loyalty and a devoted school spirit is the development of the Saint Patrick celebration. It is perhaps to this observance that alumni review with especially pleasant memories their Alma Mater, just as the eager undergraduate awaits with keen anticipation the traditional custom. March 17th has been celebrated by the engineers at the University of Missouri since 1903, and the School of Mines has observed the celebration since 1908.

Before the year 1908, Saint Patrick's Day had been observed at the school only by the "wearing of the green" by some of the more loyal sons of Old Erin. Beginning in 1908, Missouri School of Mines instituted the first formal Saint Patrick's celebration, a tradition which has been sacredly observed to this day.

In the spring of 1908, there appeared upon the school bulletin board an invitation from the engineers at Missouri University to the students at Rolla to send a representative to Columbia to participate in their St. Pat's celebration. When the students, after a very enthusiastic meeting, raised more than the necessary funds to send the representative to Columbia, the question arose as to why their own institution should not have a similar observance. At least the proposal met with wild approval, and George Menefee was unanimously elected to act as the first Saint Patrick. A committee was appointed to prepare the initial celebration that was destined to become traditional.

The committee promptly and efficiently prepared the preliminary details. Their work was reported to have been secret, as the famous date, March 17, was a regular school day, and the reaction of the faculty to such a holiday could not be foretold. The night before the

famous event was devoted to such tasks as decorating Norwood Hall, informing all students of the holiday, and giving other necessary instructions for the following morning.

On the morning of March 17th, at 8 a.m., every student reported to the Frisco Station according to instructions, where they were supplied with green sashes and shillalahs. Then came the parade led by the school band, followed by Saint Patrick and his Pages, with the classes in order of their rank behind the Patron Saint. The procession, after traversing the town boulevard, marched to Norwood Hall, where the senior class and Director Young were dubbed as the "Knights of Saint Patrick." The historic day's activities ended with a band concert. The tradition had been definitely established at Missouri School of Mines.

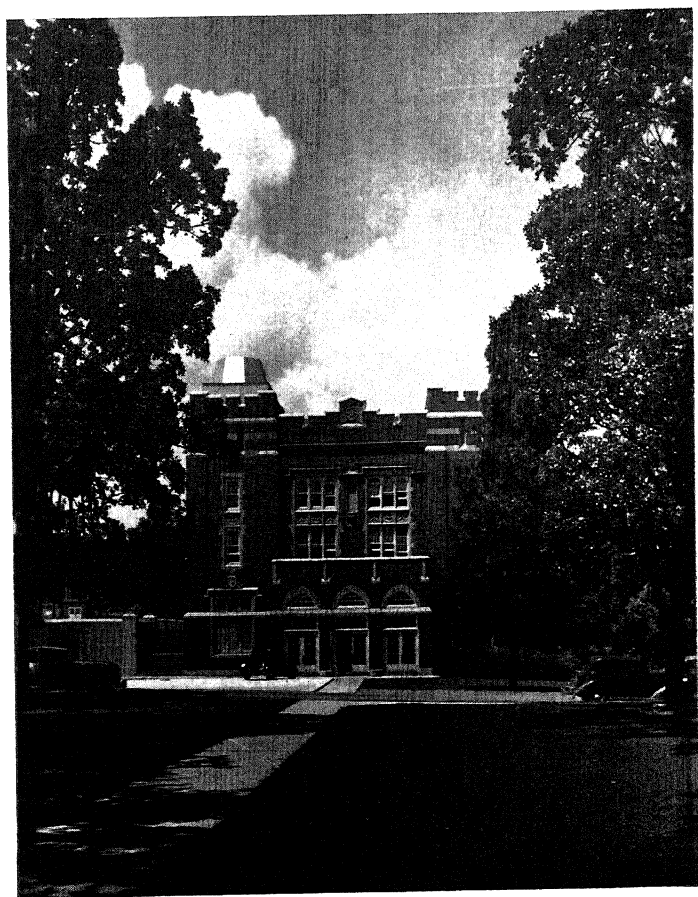
The following year the program was turned over to the juniors, a practice that continued until 1930, when the St. Pat's Board was organized. In 1910, the freshmen began the custom of going to the woods for shillalahs. There was no afternoon program that year.

The year 1913, witnessed the most elaborate celebration of Saint Patrick, in the early years. The campus ground west of Parker Hall was decorated with tents and had all the characteristics of a real carnival. This well-organized student festival was endowed with the typical sideshows, a fortune teller, the bearded lady, and a show for men only. Two other events which made the occasion more realistic were a moving picture show free to all, and the grand finale of the evening, a Masked Ball. The Masked Ball marked the beginning of a new phase of the St. Pat's Festival. This ball was held in Mechanical Hall with over one hundred masqueraders in a grand march led and reviewed by Saint Patrick. This ball has been held annually in Jackling Gymnasium since 1916.

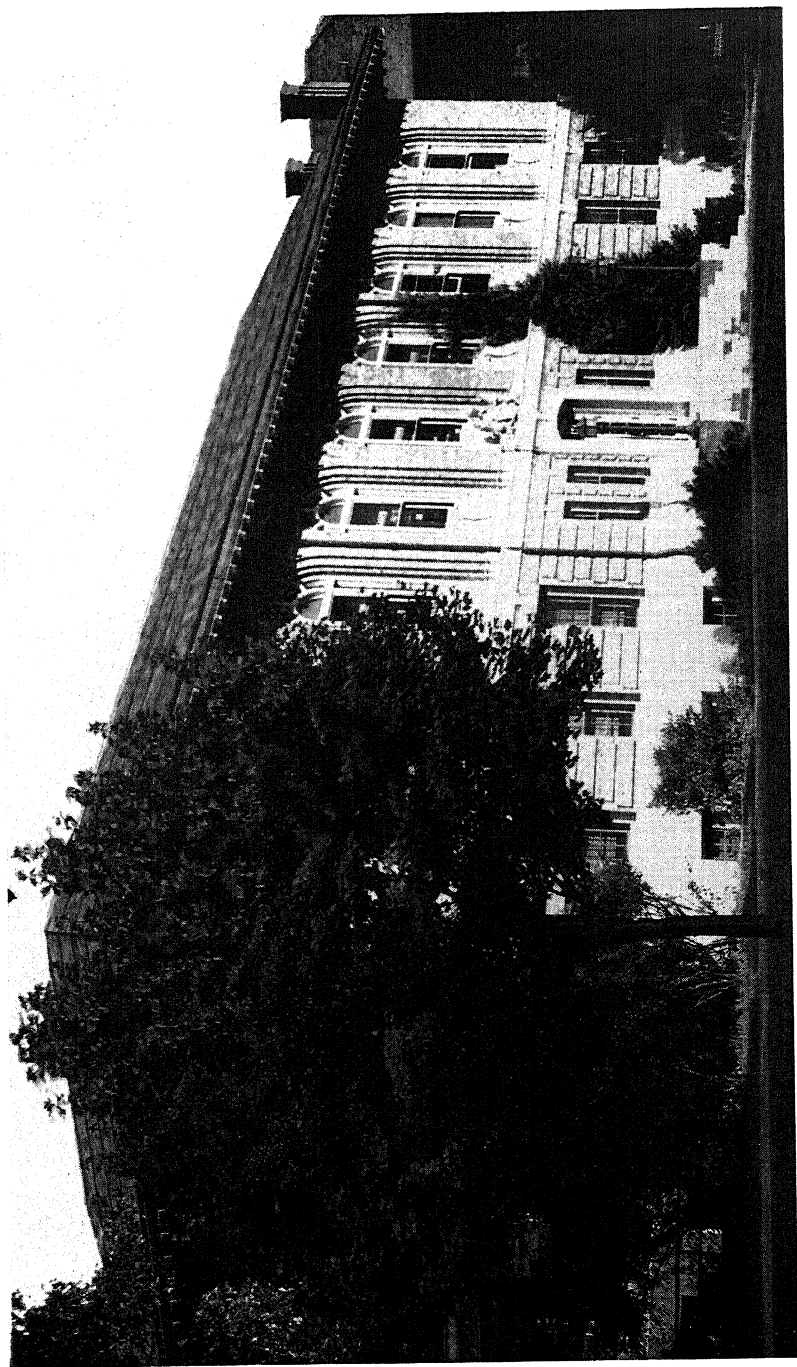
The 1915 celebration initiated another special practice, the crowning of the first queen, and from this date the affair has taken on a social aspect. Miss Helen Baysinger of Rolla, had the honor of being the first queen of Saint Patrick at Missouri School of Mines. In 1918, Mrs. Frederick D. Gardner, wife of the Governor of Missouri, was selected as queen.

The Saint Patrick celebration has continued to be observed by all students down through the years. It is the outstanding event of the spring semester. It has since been expanded into a three-day holiday and constitutes a real spirit of cooperation and achievement for the students. This has become an essential phase of engineering education of all Miners.

A history of student activities would be incomplete without mention of the famous minstrels. They evidently reached the height of their



JACKLING GYMNASIUM



PARKER HALL—ADMINISTRATIVE CENTER OF SCHOOL

popularity about 1910. The ROLLAMO for 1910, gives an excellent account of the two minstrel performances of that year. The Miners' annual minstrel was given at Mechanical Hall on February 5, and the boys were greeted by two full houses. The young ladies of Rolla gave a minstrel in April of the same year, for the benefit of the ROLLAMO. The success of the minstrel and the appreciation for the time and efforts of the young ladies was expressed in the ROLLAMO of 1910, as follows:

"The show was as advertised the social event of the season and too much cannot be said in praise of the spirit in which the young ladies volunteered to donate their time in preparing this performance which was of a character seldom equalled by professionals. The ROLLAMO Board is very deeply indebted to them for the financial assistance rendered, which made it possible to place this book in your hands at such a reasonable cost....."

Such programs and activities seem to have been a very common form of local service to the School of Mines in its early history. Numerous societies and organizations were formed by the students; for example, eating clubs continued to flourish on the campus. Some of these endured for only a few years, while others of a more permanent character organized themselves as chapters of national fraternities. The Muckers Club in 1917, was chartered as the Alpha Zeta Chapter of Lambda Chi Alpha Fraternity. Some of the active clubs included, The Pipe and Bowl, Satyrs, Trowell Masonic, Cosair, Bonanza, Prospectors, Quo Vadis, Beanery, Training Table, Miners, and the Independent Club. A Latin American Club composed of students from those countries existed in 1915.

In 1916, the professional engineering fraternity, Theta Tau, established its Iota Chapter. The MISSOURI MINER stated that the organization of this fraternity "would bring the institution into closer touch with other mining schools, and with the engineering profession in general." In the fall of 1919, a group of Catholic students organized the Mercier Club, named after Cardinal Mercier the great spiritual hero of the First World War. The Young Mens' Christian Association continued as one of the greatest service societies at the school. In 1916, it held a membership of 148, and counted among its many activities such worthwhile services as meeting new students, helping them to secure living quarters, and aiding them to become orientated into college life.

In October, 1915, an Alumni Association was organized. Such associations had been formed as early as the 1890's, but had never become permanent. This new association formulated as its major objective the bringing of the alumni into closer relations with each other and with their Alma Mater. The years 1915 and 1916, witnessed

Alumni Associations being formed in St. Louis, Joplin, and Kansas City.

A student council was organized during the 1910-11 school year. It sought to give student opinion weight in the shaping of school policies. The first council consisted of fifteen members and during the first year of its existence performed such duties as recommending to the faculty measures for student discipline and giving advice to school organizations. In the spring of 1917, the council was completely revised and a new constitution was written. This revision injected new life into the much needed organization. The new council immediately established a better relationship between students and the faculty, and the organization soon won the respect of the faculty and the solid support of all Miners. Its first major project, that of obtaining subscriptions for a flagpole, was so successful that the 1917 council won the gratitude of all. The flagpole, which was erected in the fall of 1917, stood for many years as a reminder of the patriotism of this effective student council.

The 29th day of January, 1915, marked an obvious step forward in the progress of Missouri School of Mines. On this particular date, the first permanent student publication, THE MISSOURI MINER, was founded. While various attempts had been made at earlier times to found a student newspaper, such as the one called MISSOURI MINER published by A. W. Gleason at certain intervals during the school year 1912-13, the permanent development of this significant MINER weekly dates from January, 1915. The real promoter of this journalistic adventure was a student, Fred Grotts. Mr. Grotts definitely decided in the fall of 1914, that the school needed a weekly publication. With this affirmative decision, he went out to seek the literary talent so essential to the success of such a bold plan. Grotts was able to enlist the support of J. L. Head, who became the editor, and G. E. Johnson, the business manager. With these two faithful co-workers, and with Grotts acting as general manager, THE MISSOURI MINER became an established periodical.

The first MISSOURI MINER, which appeared on January 29, 1915, was a small four-page issue with a limited circulation, but it had the active support of the student body and the cooperation of the faculty. The rather timid, humble manner in which the editorial staff was feeling its way may be noted from the following editorial quotation in the first copy:

"This is our maiden journalistic effort. We ask you to deal with it leniently. It is a tender bud and the frost of too severe criticism may blight it....."

The initial number carried a heading expressing a welcome to Durward Copeland, who had just assumed his duties as director. This first issue also contained a brief article by Dr. J. W. Barley, expressing the many difficulties coincident with such an undertaking, but with words of inspiration explaining the revolutionary importance of such a publication to Missouri School of Mines.

The small four-page paper had given way to an eight-page student publication by the time of the third issue. The editorial timidity of the staff, as shown in the first copy, had changed to one of confidence and optimism. The editorial for the third number, published on February 12, stated:

"The MISSOURI MINER is now a success. The warm reception with which the first two issues were received have inspired the managers with confidence, and they felt they have been repaid in their efforts to give the School of Mines a regular weekly newspaper."

The contributions of the MISSOURI MINER to the general progress of the school have been conspicuous and numerous. Suffice to say that this student publication has worked to unite the faculty, students, alumni, and friends, into one great body for the glory, honor, and building of a greater school.

Athletics by 1909, had become a well-recognized student activity. By this date a new competitor had worked its way into the rank of intercollegiate sports—this new arrival was basketball. Back in the fall of 1906, an effort had been made by a group of basketball enthusiasts to win a place for their game among the major college sports. This attempt apparently failed, but a schedule of intramural games was held the following spring. By 1908, this activity had won its proper status among the major competitive fields of activity. The Miners' team was playing, by 1909, a full schedule of intercollegiate basketball.

The entire administration of athletics was modernized and centralized in the spring of 1909. This action was accomplished in the adoption of a new constitution by the Athletic Association. Under the new rules the Board of Control was to consist of the Athletic Director, the president and treasurer of the Athletic Association. This board was granted full power to act in all general matters pertaining to athletics. The director, who was a regular faculty instructor in Physical Education, was given full authority over the selection and management of all teams. The coach at last won complete authority over the conduct of the teams.

Under the old constitution the power had been invested in a board of control consisting of all the officers of the Athletic Association and the captains and managers of all the teams. Under this system of di-

vided responsibility, the coach, captain, and managers often competed among themselves for control over a team. Even the people of the town expected a voice in the control of teams because they frequently were called upon for donations. As a result there was often bickering and friction and occasionally the team took matters into its own hands rather than obey so many conflicting orders.

These new changes brought a new era of progress in athletics. In the fall of 1909, F. E. Dennie became Coach and Director of Physical Education. Coach Dennie that first year, brought an increased interest in athletics, which was reflected by larger gate receipts enabling the association to pay all of its obligations. Dennie's football team that fall competed with such formidable opponents as St. Louis University and the University of Missouri. The latter team was coached that year by the famous Bill Roper. In a nine-game schedule the Miners piled up 144 points to 69 for opponents and won five of their nine contests.

The famous football team of 1914, established a record that will forever stand as a goal and an inspiration for all Miner teams. The 1913 team had established an enviable record, which was characterized by the ROLLAMO as "the best record a Missouri School of Mines team ever made." It had lost only one game and had built up a total of 265 points to only 60 for the opposition. Thus, the groundwork for the greatest of all teams, that of 1914, had been thoroughly laid.

The record of the 1914 team is so astounding that it is given here:

Miners

19	Washington University	0
40	Arkansas University	0
87	Kansas School of Mines	0
68	Drury College	0
104	Pittsburg, Kansas Normal	0
150	Kirksville Osteopaths	0
9	University of Missouri	0
63	St. Louis University	0

This all-time record of 540 points to 0 for opponents won respect and attention from newspapers and sports writers from all over the nation. This Miner team was by all standards the champion club of the state and under modern rating systems would have ranked among the best in the nation. The national recognition won by this famous team may be noted by the schedule for 1915, which included such recognized opponents as the University of Illinois and Texas A. and M.

In the fall of 1919, a course in Physical Education was first listed as a part of the freshman requirement for all curricula. The subject was listed for both terms of the freshman year. Two hours per week were devoted to this training. As a result of the required training,

athletics has continued to play a major role in student life, both curricular and extra-curricular.

Through the generosity of a gift from its famous alumnus, Daniel C. Jackling, the school graded and prepared an athletic field. The 1910 ROLLAMO states that about 7,000 cubic yards of rock and clay were removed and the entire field was then resurfaced at the new level. At the north end of the field a concrete bleacher 300 feet long was erected. At a mass meeting in the fall of 1909, the students unanimously agreed to name the new gridiron, Jackling Field, in honor of the famous graduate who made possible this marked improvement to the school. The construction of Jackling Gymnasium in 1915, meant that athletics at last had won a place of supreme importance among school activities.

The school library, an essential part of the study, research, and academic work of any institution, witnessed a remarkable increase in accessions from about 7,000 volumes in 1908, to around 22,000 in 1920. Library circulation for the years from 1914 to 1920, recorded an increase from 4,500 per year to about 9,000 volumes.

The first professionally trained Librarian, Jesse Cunningham, was appointed in 1912. He served the school until his resignation in February, 1916, to become Librarian for the City of St. Joseph, Missouri.

From 1905 to 1913, the library occupied quarters on the first floor of Norwood Hall. By 1912, the growing number of volumes had rendered the space inadequate, so in 1913, the library was moved into its present location on the second floor of Parker Hall.

One of the first student loan funds was established about 1909. Among the many benevolences and gifts granted the institution by her distinguished graduate, D. C. Jackling, the loan fund bearing his name was a most generous contribution. The purpose of the fund was to assist worthy students who were unable to finance their education by other methods. Loans of more than \$100 were not to be issued to any one student during a calendar year. This fund is first mentioned in the 1910-11 catalog.

The State Mining Experiment Station was established at the School of Mines on June 1, 1909. This experiment station sought to conduct research in the many problems relating to the mineral industries of the state. Its establishment represented an attempt to harness the research facilities of the institution so as to give more complete service to the people of Missouri. Thus, the mineral wealth of Missouri would be materially increased. The officers of the station in the year 1919, included: President A. Ross Hill of the University of Missouri; A. L. McRae, Director of the School of Mines; G. L. Cox, Professor of Mineralogy and Geology; C. R. Forbes, Professor of Min-

ing W. G. Turner, Professor of Chemistry; H. T. Mann, Professor of Metallurgy and Ore Dressing; and M. H. Thornberry, Research Assistant.

The State Geological Survey, located on the campus of Missouri School of Mines, continued to render useful service to the state in the fields of geology and mineral resources of Missouri. It conducted extensive investigations into the geology and topography of the various counties and areas.

In May, 1908, H. A. Buehler became State Geologist and head of the Survey. Buehler held this position until his death in 1944. During his long period of service Buehler built the Survey to one of the most efficient bureaus of its kind in the United States. In recognition of his services to Missouri and to the science of geology, Buehler was granted the honorary Doctor of Science by the School of Mines in 1925.

The outbreak of the First World War in April, 1917, found a patriotic spirit prevailing the faculty and the student body. The students were ever ready to serve their country and to prepare themselves for work best adapted to their qualifications. The Board of Curators at a meeting in Columbia, on April 5, 1917, instituted training in Military Science and Tactics at Missouri School of Mines. This course, which was established in the fall of 1917, was required of all physically able male students during the freshman and sophomore years.

The burning zeal of the students to serve their nation was revealed when they adopted a program of voluntary drill immediately following the war declaration. On April 6, 1917, a notice was published in the MINER of a meeting to be held that day to make the necessary arrangements for starting drill the following week. This voluntary system of training got under way on April 10, when fifty-five reported for their first exercises. Professor G. A. Muilenburg was Commander of the Miner Contingent. It was estimated that twenty-five men in the school had from a few weeks to several years of military training and that competent officers would not be lacking. The drill periods were held on Tuesday and Thursday afternoons from 4 to 5 o'clock.

The status of the School of Mines in such a total war was a subject of discussion. Students at the school were evidently uncertain of their own future and of the course that would be most beneficial to the nation at war. To clarify the situation, a directive was published by Director McRae in July, 1917, which sought to aid the student in his possible choice of service to the nation in the years ahead. While the pamphlet pointed out the first obligation for young men was that of enlistment in the Army or Navy, it expounded the growing need for the college engineering graduate not only in the war effort but also in

the critical postwar period. Those not needed in the armed forces were urged to remain in school. This tended to give direction and purpose to the uncertain student. To dispel any rumor that the School of Mines might not open in the fall of 1917, the directive specifically stated that the institution would open on September 10. As a further means to discount uncertainty the MINER carried headlines on August 24, stating that the school would open on schedule.

There was considerable delay in the installation of the military program in the fall of 1917, and when by September 28, the War Department had not detailed a commandant for the School of Mines, the authorities decided to initiate the program. Professor Muilenburg, who had conducted voluntary drill the previous semester, was placed in charge. It was decided to fix the drill periods on Monday, Wednesday, and Thursday from 4 to 5 o'clock. All physically able freshmen and sophomores were required to take the training, and others might elect it.

Early in October, the military program was initiated with the holding of the first drill exercise. The faculty committee in charge consisted of: Professors Muilenburg, Armsby, McConnel, McRae, and Wallis. Cadet officers were soon appointed and general orders were delivered. For the remainder of the year 1917-18, Muilenburg was the commandant with rank of Colonel and Armsby held the rank of Major.

It was reported that some of the freshmen and sophomores were absent from the first exercise, due to the fact that they did not know it was compulsory. One of the early orders, dated November 14, 1917, established rules governing the matter of absences. Five unexcused absences were allowed each student for a semester. All absences over five had to be made up. A student with more than eight unexcused absences did not receive credit for the work of the semester. On November 22, an order provided that any man reporting for drill and not in proper uniform would be counted as absent. For the second semester of the year the allotted unexcused absences were reduced to only three. The final drill of that year was held on May 20, 1918.

At the beginning of 1918, the school offered its facilities to the United States Government for the training of men in the war effort. In April, a government representative inspected the school equipment, and concluded that it was sufficient to give the special training. This representative was very much impressed with the work of the school, and recommended that 160 men be detailed to the school for training.

The special training program opened on June 15, 1918, with 160 men enrolled, including four officers. Forty enrollees studied mining, while the other 120 registered for work in Mechanical Engineering.

The courses actually pursued included wood shop, forge, machine shop, gas engines, pipe fitting, and electric motors, for training as general mechanics. The trainees worked several hours each day in the laboratory, and in addition were subjected to two hours in drill. Their busy day began with first call at 5:45 a. m., and ended with taps at 9:45 p. m.

This first detachment completed its training in August, and a second group was on hand to take its place. The second contingent was in training until October 15. It received practical instruction in mining, road building, machine shop, forge and blacksmithing, gas engines, and electricity. It was anticipated that a third company of trainees would be sent to the school under the program, but the end of the war in November, 1918, made a continuation of the training unnecessary.

The most highly publicized of the School of Mines contributions to the war effort was the Student Army Training Corps, popularly known as the S. A. T. C. This program was officially inaugurated on October 1, 1918, in an appropriate and patriotic ceremony. This service, with the participation of the Student Vocational Trainees and the Home Guard, was conducted in front of Parker Hall. A large crowd attended this patriotic observance. Thus, the institution was inducted as a war-training center. It was two weeks following the formal initiation before the induction papers were signed, and on about October 16, the students occupied their barracks in Mechanical Hall. Those enrolled became a blended combination of the student and soldier.

The armistice ending the war came in about five weeks after the S. A. T. C. had been launched, and hence, the program never had the opportunity to demonstrate its usefulness as a system of training. With the signing of the armistice, and the coming of peace, the incentive and patriotic zeal behind the program weakened. There developed in the corps a feeling of unrest and dissatisfaction under the strict war-time army discipline. Therefore, on December 14, 1918, the S. A. T. C. was mustered out and the experiment became history. One of the corps members wrote an article for the *ROLLAMO*, expressing in a vivid manner, the conclusion of this war program:

"Retreat on that memorable day will never be forgotten by those who participated. As Old Glory was drawn down it brought with it a feeling, not of joy,—which is hard to describe. Perhaps we realized that many men had done more than we, and that our opportunity to serve on the battle field had ended."

The war-service record of Missouri School of Mines was remarkable and enviable. Of the approximately 300 students enrolled at the

beginning of the conflict about eight-five per cent heeded the call of their nation. It was reported that by the close of hostilities only forty-two students of the original 300 remained at the school. Also of this number sixteen were in the Engineers Reserve. The institution furnished eighty-five commissioned officers to the armed services. Two of its sons in France received the Distinguished Service Cross awarded at the hand of General John J. Pershing.

The above admirable record of the student body does not exhaust the contributions of the school. Her alumni and faculty made records that brought honor to their Alma Mater and to the state of Missouri. This service consisted of both military training and research in strategic war industries. The great alumnus, D. C. Jackling, was called to the service of his country by the United States Government. He left his key position to superintend the construction of explosive plants involving the expenditure of \$90,000,000. As reported in the *MISSOURI MINER*, Jackling left a position paying approximately \$100,000 annually to donate his services for the duration of the war for the sum of \$1.00.

The 1919 *ROLLAMO* was published as the Victory Edition. It was dedicated to the students, alumni, and faculty of Missouri School of Mines who contributed to the victory by serving in the armed forces. This dedicatory edition contained a list of all faculty, alumni, and students who served under the colors. Special recognition was given the nine men who paid the supreme sacrifice.

As an outgrowth of the First World War, the Reserve Officers' Training Corps was established at Missouri School of Mines in January, 1919. The primary purpose of the R. O. T. C. was to train reserve officers at civil institutions by systematic and standardized instruction. An article in the *MISSOURI MINER* referred to the training as a part of Uncle Sam's fire insurance. The governing body of a school or college that applied for its establishment had to agree to certain basic rules required by the War Department. First, three hours' drill per week was required of all physically fit freshmen and sophomores, two years' drill being a prerequisite for a degree. Second, five hours a week elective credit could be counted by juniors and seniors toward a degree. In return the War Department appointed an officer to act as professor of Military Science and Tactics, and in addition furnished the arms and equipment for the unit.

In contrast to the S. A. T. C. the trainees in the R. O. T. C. were not under military discipline, except during the hours of drill. Hence, the work interfered but little with the regular work of the student, both curricular and extra-curricular.

Eligibility to participation in the training was limited to students of institutions in which the R. O. T. C. was established. All were required to be citizens, who were not less than fourteen years of age, and who were physically fit to perform military service. By May, 1920, the total enrolled included 104 in the first course or basic, and three in the advanced course.

A Vocational Training Program for war veterans was established at the school in May, 1919, and by the summer term of that same year fifty ex-servicemen were already taking advantage of this training. The training was under the supervision of a Federal Board of Vocational Education. As the real development of this work came in the period following 1920, a more detailed discussion will appear in the next chapter.

The period from 1907 to 1920 ended with the resignation of Austin L. McRae as Director on July 1, 1920. His service as director had covered a five-year period filled with momentous events in the history of the school. His affiliation with the school as a professor dated back to 1891, and during this long period of employment he witnessed the growth of the school from a small institution of three buildings and an enrollment of less than one hundred to the modern progressive technological School of Mines of 1920, with nine edifices and an enrollment of more than three hundred. He successfully administered the school affairs through the difficult years of the First World War and handed to his successor an institution prepared for a future service even greater than that rendered in the past.

ENROLLMENT 1907 - 1920

1907-1908.....	229
1908-1909.....	254
1909-1910.....	231
1910-1911.....	193
1911-1912.....	187
1912-1913.....	181
1913-1914.....	251
1914-1915.....	262
1915-1916.....	265
1916-1917.....	288
1917-1918.....	232
1918-1919.....	235
1919-1920.....	393

BACHELORS DEGREES 1907 - 1920

Year	Mining	Met. Engr.	Civil Engr.	Mech. Engr.	Elect. Engr.	Chem. Engr.	General Science	Total
1907-1908	20	..	4	..	..	..	5	29
1908-1909	18	1	4	..	..	..	11	34
1909-1910	30	3	3	..	..	..	6	42
1910-1911	26	3	..	..	..	..	5	34
1911-1912	23	3	2	..	..	..	11	39
1912-1913	10	4	1	..	..	..	7	22
1913-1914	12	2	1	..	..	..	8	23
1914-1915	9	1	3	..	..	..	2	15
1915-1916	17	4	9	..	..	..	5	35
1916-1917	21	6	6	1	1	..	1	36
1917-1918	11	9	2	1	..	..	1	24
1918-1919	8	2	..	1	..	3	1	15
1919-1920	27	7	10	1	..	9	1	55
Totals....	232	45	45	4	1	12	64	403

ENROLLMENT BY CURRICULA
1916 - 1920

Year	Mining	Met.	Civil	Mech.	Elect.	Chem.	Cera- mic	Gen.	Sci.	Unc.	Total
1915-1916	95	27	33	..	..	..	..	68	11	31	265
1916-1917	105	27	15	3	3	11	..	84	5	35	288
1917-1918	72	19	13	6	4	16	..	65	3	34	232
1918-1919	71	16	11	4	3	19	..	93	1	17	235
1919-1920	125	31	20	5	6	26	..	134	9	37	393

MASTER OF SCIENCE DEGREES
1907 - 1920

1907-1908.....	0
1908-1909.....	1
1909-1910.....	1
1910-1911.....	0
1911-1912.....	1
1912-1913.....	0
1913-1914.....	1
1914-1915.....	0
1915-1916.....	1
1916-1917.....	1
1917-1918.....	0
1918-1919.....	0
1919-1920.....	4
Total.....	10

PROFESSIONAL DEGREES GRANTED

1907 - 1920

1907-1908.....	5
1908-1909.....	5
1909-1910.....	13
1910-1911.....	3
1911-1912.....	7
1912-1913.....	1
1913-1914.....	6
1914-1915.....	9
1915-1916.....	12
1916-1917.....	9
1917-1918.....	6
1918-1919.....	6
1919-1920.....	9
<hr/>	
Total.....	91

CHAPTER VI

ERA OF CURRICULAR EXPANSION AND BROADENED TRAINING

1920 - 1941

In July, 1920, a director was appointed who wielded his influence over the school and shaped its policies for the succeeding decades. In fact, the results of his work are evident in the program and the activities of the School of Mines today. This director, who served for seventeen years, the longest term of any administrative head, was Charles Herman Fulton.

At the time of his appointment, Fulton was professor of Metallurgy at Case School of Applied Science at Cleveland, Ohio. Dr. Fulton was born in Germany of American parents in 1874, but came to America at an early age. He received his preparatory training at Pratt Institute, Brooklyn, New York. His collegiate training was at Columbia University School of Mines, from which he earned the degree Engineer of Mines in 1897. In 1911, he was awarded the honorary Doctor of Science degree from the University of South Dakota, in recognition of his meritorious work in the field of Mining and Metallurgy.

His pedagogical experience included: an instructorship of Assaying at the Columbia University School of Mines, 1898-99; instruction in Metallurgy at the University of Wyoming, 1899-1900; professor of Metallurgy at the South Dakota School of Mines, 1900-05; president of the South Dakota School of Mines, 1905-11; and professor of Metallurgy at the Case School of Applied Science, 1911-20.

Dr. Fulton held national recognition as a metallurgist and was the author of several well-known books in that field. He was also a member of several professional engineering societies, and during his directorship was very active in all such associations. His membership included the American Institute of Mining Engineers, Mining and Metallurgical Society of America, and the Theta Delta Chi Fraternity. In addition, he was a member of two honorary societies, Sigma Xi and Tau Beta Pi.

The Fulton period, 1920-1937, witnessed another epoch in the progress and increasing service rendered by the institution. It was noted for the largest number of graduates to that date in the school's history, many of whom brought honor to their Alma Mater and to the State of Missouri. The service of the school to its students and, hence, to the state, was particularly enhanced by the general broadening of the curricula. This curricular expansion was designed to keep the

school abreast of the basic flood of industrial developments that had become so marked by the 1920's. These new changes were the result of revolutionary discoveries in the fields of refrigeration, air conditioning, gasoline motors, automobile, communications, radio, power lines, sanitary engineering, and the many other fields of specialization. It was an extremely difficult task to keep the curricula synchronized with the demands of industry and at the same time provide for coordination with the humanistic studies.

Under Fulton's direction, the faculty immediately undertook the problem of curricular revision. It sought to develop a more thoroughly trained graduate by increasing specialization in the fundamentals of an engineering education. But in the same faculty sessions, greater emphasis was placed upon the cultural subjects. The cultural subjects for the engineer were becoming a necessity, since he had to live in a complex social, political, and economic world. Fulton clearly envisaged the necessity for such subjects as English, history, economics, sociology, and psychology. The new type of leader was to be one with a solid foundation in basic engineering subjects and also a graduate prepared to assume responsibility in any type of position.

One of the early curricular innovations of the Fulton Régime was the establishment of the Department of Economics. This training was added in the fall of 1920, but as a professor for the new chair was not found, the work was not instituted until January, 1921, when Professor Scott Boyce took charge. As Boyce did not accept the position until after the schedule had been listed, his classes had to be arranged after school hours for the first semester. The first offering in the Economics department, in addition to the two semester courses in principles of economics, comprised such subjects as: economic history of the United States, economic geography, labor problems, and business organization. To the above subjects the department added, in the fall of 1921, courses in the principles of sociology and social psychology. This was the first offering of sociology in the history of the school. The following year, a course in statistics was offered, but the work in economic history and economic geography were no longer given.

It is interesting to note that by 1925, the department of Economics had expanded to include the following courses: American government, business law, finance, history, social evolution, general psychology, and genetic psychology. This year marked the real inauguration of the social studies into the school curriculum; however, aside from the two beginning courses in economics, the work in the social studies has remained elective. M. D. Orten taught the economics after 1924, while the courses in history, psychology, and sociology were given by other members of the department.

The work in history, psychology, and sociology remained in the Economics department for only one year, and in the fall of 1926, was transferred to the newly created department of Biology. The Economics department remained as a division offering work only in that field down to 1941.

A department of Hygiene and Student Health was organized the first year of Fulton's term. A course in hygiene was made a requirement for all curricula. The interest of Dr. Fulton in the field of biology was further revealed when it is noted that this department also taught work in zoölogy, botany, bacteriology, and microscopy of technical products. In November, 1924, the faculty voted to offer no credit for the hygiene course after the succeeding semester. In 1926, the department of Biology was organized, and all instructional work was transferred to that department. Hygiene and Student Health continued, however, to be listed as a department through 1941.

The department of Biology was organized in 1926. To this department was added the work in history, sociology, and psychology. In 1939, the department was henceforth designated as that of history, psychology, and biology. C. J. Millar was made the head of this department.

Perhaps the most significant curricular expansion of the period was the addition of the department of Ceramic Engineering. On December 1, 1925, representatives of the Missouri Refractories Association and the Missouri Clay Association held a meeting in Rolla, and urged that Missouri School of Mines establish a chair of Ceramic Engineering. It was pointed out at the meeting that Missouri ranked high among the states in ceramic products, and the unfortunate fact was reported that the clay industries were having to go outside the state for their personnel. Even more unfortunate was the report that Missouri boys were having to go outside the state for such training.

In response to the meeting and the general demand on the part of the clay industries, the Board of Curators in January, 1926, established the department of Ceramic Engineering at the School of Mines. A former alumnus, A. P. Green, was one of the active promoters of this curriculum. The work got under way in the fall of 1926, with fifteen students enrolled. The department soon began to attract students, and by 1930, it claimed a total of thirty-nine. Unfortunately the depression had an adverse effect, and its majors declined to twelve by 1935. Dr. Edward Holmes was the first head of the department.

The Missouri Clay Testing and Research Laboratories were installed on the campus in 1928. They were under the general direction of the Ceramic Engineering Department. The laboratories gave free

technical advice to citizens or industries of the state, although for some research projects a small fee was charged.

In 1921, Petroleum Engineering was added to the list of options in Mine Engineering. Professor Carroll R. Forbes was the head of this department from 1909 to 1941. The four short courses in mining, assaying, surveying, and electricity, which had been a part of the curricula since 1892, were no longer offered after 1920. By 1921, the freshman course had practically assumed its present form. The year's work included the regular freshman requirement in English, plane and spherical trigonometry, analytical geometry, surveying, chemistry, elementary drawing, military science, and physical training.

In 1930, Curriculum IV, or General Science, was completely overhauled. There had been criticism of this curriculum, especially from those who were of the opinion that the course did not measure up to the high standards selected for the School of Mines. These critics favored the inclusion of more technical subjects to make the work conform more nearly to the regular engineering course. The *MISSOURI MINER* of March 8, 1926, carried an answer to those who would minimize the general science program. The writer elaborated on the remarkable success of those who had majored and received degrees in this course. It listed some thirty-seven of the total of seventy-two graduates, who had achieved extraordinary fame in the industrial world.

Nevertheless, in 1930, the work in this department was revised. In May of that year, Dr. Fulton appointed a special committee to design a program of courses in this field "as would be commensurate with a school of technology." On November 3, 1930, Dr. Woodman presented the report of the committee to the faculty. Among other things the number of credit hours for a degree in the curriculum was raised to 150 hours plus military and physical education. This placed it on the same basis as that of the regular engineering courses. The field was, henceforth, to be known as the Science curriculum, and the degree of Bachelor of Science was to have the major subject of specialization so designated. Thus such a degree would read as a Bachelor of Science, Chemistry Major, etc. Hence, students were required to elect majors and minors in specific fields. These changes went into effect in September, 1931.

Civil Engineering underwent considerable expansion in order to serve the industrial requirements of the period. With the advent of the automobile as a product of mass production, the construction and maintenance of highways became one of the major industries of the country. More and more responsibilities were placed upon the engineer in the location, construction, and maintenance of highways. This increasing



CHARLES HERMAN FULTON, DIRECTOR, 1920-1937



CAMPUS VIEW

demand for civil engineers trained in highway construction was reflected in a series of courses offered. Highway-materials testing was added in 1931. Courses in highway engineering became more important, and, in 1930, a subject called "highway-transport economics" was listed in the catalog.

Hydraulic Engineering involving the use and control of water power became particularly important after 1933. The importance of water-power engineering was stressed in the construction of such gigantic projects as Boulder Dam, Tennessee Valley Authority, Bagnall Dam, and countless others. By 1936, courses had been included in water-power engineering, advanced hydraulics, and river and harbor engineering.

In 1931, the work in Civil Engineering was broadened to meet another demand when the sanitation engineering option was added to this curriculum. The growth of large cities had created many complicated problems in relation to a pure water supply and the disposal of sewage. The sanitation engineer was called upon to solve the many technical problems coincident to city administration. In this field, the sanitary engineer came into direct contact with the sciences of chemistry, bacteriology, and even medicine. Those students, specializing in sanitary engineering in addition to such courses as water supply, sewerage, drainage, also took advanced courses in biology and chemistry.

Professor Elmo G. Harris, who had served the institution for forty years, retired in 1931, from the active work in the Civil department to the rank of Professor Emeritus. Professor Joe Beaty Butler, who had been affiliated with the school since 1920, became head of the department. He has served in this capacity to the present time.

Beginning in 1929, Civil Engineering forged ahead of other curricula in number of students with a total of 138 enrolled. It maintained this lead up to 1938, when it fell behind Mining and Mechanical Engineering. During the first nine years of the period, 1920-29, those pursuing the mining curricula led the list of enrollees by a substantial majority.

The Vocational Training Program, which had been instituted in 1919, for the training of disabled veterans of the First World War, continued to the close of the 1925-26 school term. In May, 1920, Major Charles E. Cooke was sent to Rolla to help organize the department of Vocational Training for special benefit of ex-servicemen, who were not qualified to take the regular collegiate work. This special instruction included work in topographic engineering, highway engineering, and oil field engineering, the United States Geodetic Survey, the Missouri State Highway Department, the Missouri Geological Survey, and the Federal Vocational Board, all cooperated in placing the graduates in positions.

From the enrollment of fifty in the beginning, the number of vocates had increased to seventy-two by the 1920-21 school year, and to 218 by the 1921-22 term. The respect shown by the National Government for this training at the School of Mines was revealed when it notified the Federal Board that it would employ all vocational graduates of the institution. Some of the graduates continued their studies and received regular college degrees. A later president of the Alumni Association, Fred Schneeberger, began his career at the school in this program.

Electrical Engineering had remained as a part of the Physics department from the time of the beginning of degree work in the field to 1924. In the fall of that year, it was made a distinct department under the chairmanship of Professor Floyd H. Frame. Professor Frame has served as head of this department to the present date. The chief problem of this department was to keep its curriculum in step with the startling electrical revolution that continued after 1920. This revolution was especially noticeable in the field of communications and electronics, and courses establishing this training were listed in the catalog. The continued development of the radio during the 1920's resulted in courses in radio communications as early as 1924. There was likewise a tendency to offer more highly specialized and advanced courses in Electrical Engineering—thereby preparing the student for a more thorough service in the electrical age.

The department made a rather slow beginning after the degree work was instituted in 1916, and by 1920, only eight students were enrolled as Electrical Engineers. But after 1924, the department registered remarkable gains in number of specialists. From a total of thirty-eight, in 1924, the enrollment in the work had increased to seventy-four by 1927, and after a decline during the depression years in the early 1930's, it claimed over one hundred students by 1938.

The growth in the field of Mechanical Engineering was startling after 1920, and the Fulton Administration brought new courses with an increasing specialization in the department. The developments in refrigeration and air conditioning resulted in courses in this phase of specialization as early as 1924. Also, a course in heating and ventilation had been approved in the early 1920's. In 1931, a course in welding was added, and, by 1938, aeronautical engineering was given recognition, when aerodynamics and airplane structures were taught. From 1921 to 1942, Professor R. O. Jackson was head of this department. Since that time, Dr. Aaron J. Miles has been chairman.

This department was particularly slow in attracting students after the adoption of degree-granting in 1916. As late as 1923, there were only eleven students specializing in the division, but this was increased

to thirty-nine by 1928. The real development came in 1930, when seventy students were enrolled in the department and then after a brief decline during the early 1930's, it had a total of 123 students by 1938—second only to Mining.

It is interesting to note that the department of Chemical Engineering was listed in the catalog as the department of Chemistry up to 1936, when for two years, it was called the department of Chemical Engineering and Chemistry. Since 1938, it has been designated as Chemical Engineering. In response to demands from industry, the petroleum-refining option was added in 1924. This program called for such courses as petroleum chemistry, oil production methods, and petroleum engineering hydraulics. The new field of synthetics and plastics has increased the importance of this department. Dr. Walter T. Schrenk has been chairman of the department since the fall of 1929.

The enrollment of this department has shown a steady upward trend since 1920. From the seventeen majoring in this curriculum in 1922, there was an annual increase to ninety-one by 1931. The depression temporarily deflected the upward trend, but by 1938, those specializing in Chemical Engineering had surpassed one hundred.

Metallurgy perhaps showed the least change in curriculum of any of the degree-granting departments over the period. Enrollment statistics show a wide fluctuation in this department. From a figure of twenty-seven in 1920, the number varied from a low of eighteen students in 1926, to a high of sixty by 1930. The depression had a drastic effect on this department also, when the total was reduced to only twenty-eight in 1933. But after 1936, recovery was rapid and by 1938, the data show a total of 120 students. This department was given a new title in the 1937-38 catalog as that of Metallurgical Engineering and Ore Dressing. Professor C. Y. Clayton was the head of this department until 1942, when Professor H. R. Hanley became chairman.

The service departments provided a more extensive course-offering thus aiding in a broadened training for the graduate. Professor G. R. Dean continued as chairman of the Mathematics department until 1930, when V. B. Hinsch became acting head. In 1935, Hinsch was elected as chairman, and Dean became Professor Emeritus. Hinsch continued as head of the department to 1941, when R. M. Rankin assumed the duties as chairman. Drawing was under the chairmanship of Dr. C. V. Mann throughout the entire period. The departments of English and Foreign Languages were merged in 1912, and continued as such to 1930. In the latter year they were again separated with Modern Foreign Languages under the supervision of Professor O. A. Henning, and English under the leadership of Dr. J. W. Barley. The work in Physics has continued under the leadership of Professor

L. E. Woodman since it was separated from the Electrical Engineering department in 1924. L. E. Garrett was in charge of the Mechanics department until his death in 1938, when R. Z. Williams assumed the position. Geology and Mineralogy were under the chairmanship of Dr. Charles L. Dake until his death in 1934, at which time G. A. Muihlenberg became head of the department.

During the first year of the Fulton Administration regulations were enacted governing absences, credit hours, and grades. The faculty on November 5, 1920, passed a series of regulations, many of which, with slight modifications, have remained in force to the present time. The holiday absence rule was adopted providing that any student, who incurred unexcused absences for the two days preceding or the two days succeeding a regular school holiday, was to have added to his requirements for graduation not less than one or more than six hours for each offense. A second provision stipulated that a student would have one credit hour added to his graduation requirements for each total of seventeen absences a term. In 1926, this had been reduced to one negative hour for each sixteen unexcused absences per semester. Two laboratory hours were considered as the equivalent of one classroom hour.

In this same meeting the faculty voted to establish a grading system based upon a letter with an exact numerical value. The numerical equivalent of the letters was as follows:

E—95-100
S—85-95
M—75-85
I—65-75
F—65 or below

With a slight revision beginning in 1926, this numerical system has remained to the present time. Another school policy adopted at this time was the reduction of the class period from 55 to 50 minutes.

The faculty, on December 5, 1922, established a system of grade points which gave a student the benefit of S or E marks. Under the old grading system an S or an E were no better than an M. Under the new system grade of E, carried three grade points per credit hour; a grade of S, two grade points; a grade of M, one grade point; a grade of I, no grade point; and for a grade of F, one negative grade point. The number of grade points required for graduation in the regular engineering subjects was raised from ninety-eight in January, 1925, to 120 by June, 1927.

At the beginning of the Fulton term, the credit required for graduation ranged from 185 to 197 hours, depending upon the curriculum

pursued. In 1922, the credit hours required were fixed at 172 hours for all curricula exclusive of military science and physical education. In order to make the system at the School of Mines more nearly conform to that used by most large institutions, the faculty, early in 1924, reduced the credit hours given for laboratory to a ratio of one to three; that meant one credit hour for three hours of laboratory instead of one for two hours as previously. This reduced the graduation requirement to 150 hours plus military science and physical education. This is essentially the present graduation requirement.

The period of the 1920's witnessed the real evolution of graduate work at Missouri School of Mines. Supervision of the work was placed in charge of a faculty committee on graduate students. In September, 1924, the requirements for the Masters degree were fixed at 36 credit hours above the Bachelor of Science. The grade-point average was first established at 1.5, but in 1928, this was raised to 1.75. Other requirements included the oral examination and the approval of the students program in advance by the graduate committee. The standard for graduate students was further elevated in 1939, when the 2.00 grade-point requirement for the Masters degree first appeared in the catalog.

The graduate students of the school organized in the fall of 1923, with the objective of raising the standards of graduate work in general and of establishing a closer relationship with the graduate school of the university at Columbia. A program for the Doctor of Philosophy degree was first introduced into the catalog for the 1925-26 school term. The candidate for the degree had to register with the graduate school of the University of Missouri and the examinations were administered by a committee appointed by the chairman of the graduate committee at Rolla and the dean of the Graduate School at Columbia. The degree was conferred by the University of Missouri.

The Missouri School of Mines, under the Fulton Régime, initiated the policy of granting honorary degrees. The recipients were scholars who in the opinion of the faculty had made outstanding contributions to the field of engineering. Some of those receiving the honor were distinguished alumni of the school. The list of doctorates conferred from 1923 to 1940 includes.

Walter R. Ingalls.....	1923	Allen P. Green.....	1935
Henry A. Buchler.....	1925	Mervin J. Kelly.....	1936
Eugene McAuliffe.....	1927	Enoch R. Needles.....	1937
John Adrian Garcia.....	1928	George A. Easley.....	1938
Urlyn C. Tainton.....	1930	Howard I. Young.....	1939
Daniel C. Jackling.....	1933	Frederick W. Green.....	1940

Among these distinguished recipients of honorary Doctorates, the following were sons of Missouri School of Mines: John Adrian Garcia, Allen P. Green, Mervin J. Kelly, Enoch R. Needles, George A. Easley, and Daniel C. Jackling. These notable leaders had not only won distinction for themselves, but had also brought honor to their Alma Mater.

John A. Garcia was a graduate of the class of 1900 with the degree of Bachelor of Science in Mine Engineering, and the professional degree of Engineer of Mines in 1903. Following graduation, Garcia obtained extensive experience in the coal fields of Oklahoma and Illinois. He later entered consulting work in Chicago, where he formed a partnership in an organization specializing in the construction, development, operation, and examination of bituminous coal mines. The M. S. M. ALUMNUS in 1928, pointed out that it was his organization which built the two mine tipples that had held the world's hoisting record for ten years. Garcia devoted a large part of the year of 1927, to extensive consulting work for the Soviet Government. J. A. Garcia died on August 11, 1939.

A former Missouri student who has brought fame to the School of Mines and to the state is Allen Percy Green. In 1910, he purchased the old Mexico Fire Brick Company, at Mexico, Missouri. He had been attracted by the quality of the clays in that region of the state. He at once began to build up the plant, and, in 1925, began construction of the new and modern tunnel kiln plant. The plant has been recognized as one of the five largest refractories companies in the world. On account of the efforts and practices established by Dr. Green, the highest type of fire clay brick in the world is being produced at Mexico, Missouri. Dr. Greene was one of the active promoters of the department of Ceramics at the School of Mines, and among his other contributions to the school are the A. P. Green Awards. A scholarship is offered each year to an outstanding junior, based upon scholarship and leadership; and a medal is awarded the outstanding member of each graduating class.

In 1936, Mervin J. Kelly was awarded the honorary doctorate by virtue of his outstanding achievements in the field of electrical communications. His early research work was toward the development of vacuum apparatus used in communications systems. Later he won fame for his direction of a group of physicists, engineers, and technicians, engaged in research on thermionic devices, photoelectric cells, vacuum thermocouples for wire and wireless communications, and for related appliances, such as talking motion pictures and public address systems. At the time he was awarded the doctorate, he was Vacuum Tube and Transmission Instruments Development Director of the Bell Telephone

Company. Kelly graduated from Missouri School of Mines in 1914, with a B. S. in General Science.

Enoch R. Needles, the recipient of an honorary doctorate in 1937, graduated in the same class with Mervin J. Kelly, in 1914. He is rated as one of the most outstanding graduates of the department of Civil Engineering of the School of Mines. He has won national recognition as a member of the firm of Ash-Howard-Needles and Tammen, which firm acted as consultants in the construction of some of the greatest bridges in the United States, including the Triborough Bridge project in New York.

One of the most outstanding Mining Engineering graduates of the school was George R. Easley. He held the degree of B. S. in Mine Engineering, 1909, and the professional degree of Engineer of Mines, 1912. He was particularly recognized as a promoter, and held directorships in a large number of famous mining corporations. Easley had been active from 1914 to 1919, in the development and operation of tin and tungsten properties in Bolivia. From 1929 to the time he was honored by his Alma Mater with the doctors degree, he held the responsible position of Vice-President and Director of the International Mining Corporation in New York City.

The honorary degree was conferred on Jackling in a very impressive ceremony on May 2, 1933. In a brief address before the degree was conferred, Jackling said, "I would rather receive this honor from the School of Mines than from any other institution on the face of the earth." President Walter Williams of the University, conferred the degree. In an inspirational address emphasizing the noble accomplishments of the school's alumni, Williams closed his remarks with this tribute to Jackling, "The school has reason to be proud of its sons. The most distinguished of all these men is here this morning to receive honor from the school he helped to make famous."

In the fall of 1923, the school took a phenomenal step forward in the creation of the permanent office of Registrar. A committee was selected, the previous spring, to devise ways and means of improving the system of registration. Among the recommendations was one that the school employ a full time Registrar who could devote his entire time to the business of the office. H. H. Armsby was elected in 1923, as the school's first full-time Registrar. As he had already been serving as Student Advisor, he assumed the duties of both positions. Armsby served in this capacity until 1941, when he accepted a position in the government service. Noel Hubbard, who came to Rolla in the fall of 1920, with the United States Experiment Station of the Bureau of Mines, was appointed Assistant Registrar in 1923. He held this position throughout the remainder of the period. Under the leadership of

Arnsby and Hubbard, the office of Registrar and Student Advisor became one of the most efficient on the campus. A more systematic method of keeping records was established. Efforts were also made to set up a more effective system of registration.

In 1926, this office assumed the duties of a co-ordinated employment service for the graduates. To collect more data on each student as a possible aid for placement, a system of personnel reports was instituted. Previous to the creation of the co-ordinated employment program, placement had been largely in the hand of the various departments. This had not been satisfactory particularly with the growing enrollment and the increasing numbers of graduates. Now this important service had been centralized in one office with a more complete personnel record of each student for the prospective employer.

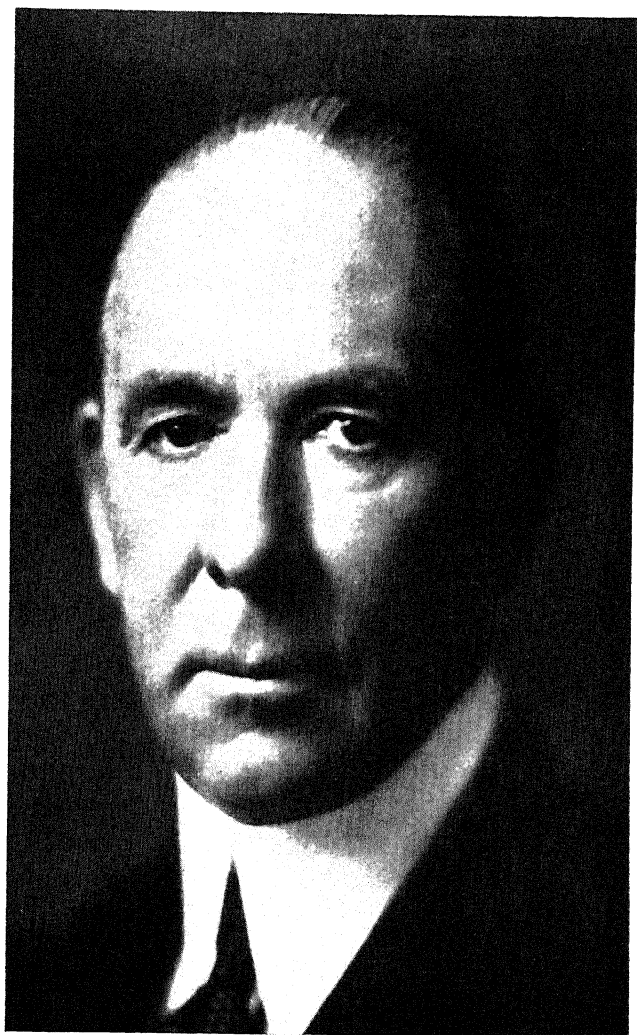
For the first four years after the institution of the co-ordinated employment service, practically all of the available graduates had found positions by the time of commencement. Then came the depression when it was more difficult to secure employment in all fields. The most difficult placement years were 1931 and 1932, but by 1933, the outlook was considerably brighter. Placement statistics for the 1934 class at the time of graduation showed a total of forty-three per cent of the graduates with positions, and, by September of that year, an average of seventy-two per cent had found employment. Following this year recovery was rapid and by June 15, 1936, a total of ninety-six per cent of the eighty graduates of that year had found positions.

One of the outstanding developments of the Fulton period was the remarkable increase in enrollment and in the number of degrees granted. In fact, by the close of the Fulton Administration, approximately sixty-seven per cent of all bachelor degrees granted since the founding of the institution had been conferred during this directorship. A total of 1,285 bachelor degrees were conferred during the seventeen years of the Fulton Régime. The enrollment figures, after reaching a low of 359 in 1922, began to register an annual increase which continued until 1931. In the fall of 1927, the total had surpassed the 500 mark and by the 1931-32 term reached an all-time high of 680. Then the effects of the depression were noticed, and, by 1933-34, the enrollment had dropped to 385. By 1936, the totals again increased which during the 1937-38 term surpassed all previous records.

A progressive step in the history of the school was made in 1920, when the Mississippi Valley Experiment Station of the United States Bureau of Mines was located on the School of Mines campus. The first officials arrived in the fall of 1920, and, by 1921, the research work of the station was well under way. The legislature in 1921, appropriated \$100,000 for the construction of a building to house this



ALLEN PERCY GREEN, FAMOUS ALUMNUS, HONORARY DOCTORATE IN 1935



DANIEL COWAN JACKLING, DISTINGUISHED ALUMNUS—CLASS OF 1892

Federal Experiment Station as well as the State Experiment Station. This new Bureau of Mines Building completed in the fall of 1923, marked an improvement in campus appearance. In addition to the State and Federal Experiment Stations the departments of Mining and Ceramic Engineering came to occupy the top floor of the structure.

In the fall of 1923, a terrace was built between Parker Hall and the new Bureau of Mines building. Walks and steps were constructed from the level of the campus down to the terrace. The terrace added to the appearance of both buildings, and has been used as a convenient place for parking cars.

The Power Plant was remodeled in 1922, under the supervision of Professor R. O. Jackson of the Mechanical department. An article in the *MISSOURI MINER* stated that with the improvements the plant was one of the best examples of "steam power plant engineering in the state." The Warehouse, a concrete-and brick, fireproof structure, was erected in 1926. It was used as a center for supplies and for storage purposes, and was located directly behind Mechanical Hall.

During the summer of 1925, a number of campus-improvement projects were carried out under the direction of Professor C. V. Mann. A tunnel 150 feet long was constructed connecting the Metallurgy Building with the main tunnel running from the Power Plant. Many new sidewalks were built, and some of the campus structures were remodeled. Some new floors were laid in the Director's residence.

The Student Health Service program was materially enhanced in the summer of 1926, when the Shaw property at the corner of Tenth and State Streets, was converted into an infirmary. This property was purchased by the school previously and, beginning with the fall semester of 1926, was used as the school hospital. Dr. S. L. Baysinger, who had already rendered years of service to the school as a member of the Board of Curators, was made the Student Health Advisor. The Board of Curators in April, 1926, authorized this increased health service. Works Progress Administration funds were later expended to remodel the hospital, and a third floor was added to increase its service to the students.

Many campus improvements were made possible from 1933 to 1936, by virtue of Federal funds through such projects as the Civil Works Administration and the Public Works Administration. These improvements consisted of repairs and painting of buildings, resurfacing and constructing tennis courts, building a 220 yard track, and the leveling of the football field north of the bleachers.

The fiftieth anniversary of Missouri School of Mines was celebrated during the first week in November, 1921. The three day program included a reception, a play, an automobile trip to Meramec Spring,

play on the golf links, a football game, an alumni banquet, organization of the Alumni Association, and a formal program. The celebration was brought to a close by a gala ball held in the gymnasium.

The formal exercises of this semi-centenary celebration were held in Parker Hall. T. A. Richard, Editor of the Mining and Scientific Press, delivered an address on "Education of the Mining Engineer." Greetings from the university were extended by Dean E. J. McCaustland, of the Engineering School at Columbia. Dr. Fulton read messages from distinguished alumni, former directors, and noted friends, who sent their best wishes, regretting their inability to attend the festivities.

One of the tangible results of the celebration was the organization of the Missouri School of Mines Alumni Association. The first officers of this organization included A. D. Terrill, President; Emory Wishon, Vice-President; and G. R. Dean, Secretary-Treasurer. The real promoter of this organization was Professor Dean, and the phenomenal success it attained was due to his untiring efforts. From an initial membership of seventy-five the organization boasted a total of 401 in September, 1925.

The initial volume of the M. S. M. ALUMNUS was published in September, 1926. This publication furnished news of particular interest to all alumni, including such features as school athletics, faculty changes, alumni weddings, association news, and employment lists. The ALUMNUS was published as a quarterly. The Alumni Association and its quarterly, the ALUMNUS, contributed immensely to the building up of a school spirit, to increasing the enrollment, and in keeping the institution in closer contact with the engineering profession.

Because of the crowded conditions in the teachers colleges of Missouri at their summer sessions, the University of Missouri established a session for teachers on the School of Mines campus. The first such session was held during the summer of 1924, and they were continuously held down through 1941. The 1941 session was the last as the School of Mines began operation on an accelerated basis after the attack on Pearl Harbor.

Library accessions recorded an astonishing upward trend. The approximate 23,000 volumes reported in 1921, had grown to 36,000 by 1930, to 43,000 in 1935, and to over 50,000 by 1940. Library circulation increased from approximately 9,000 in 1920, to 12,000 by 1930, and for 1940, to the all time high figure of 21,000.

The Reserve Officers Training Corps, a vital element of our national defense program, has been maintained at the School of Mines to the present. The corps at the school was an engineer unit. The nation continued to look to the colleges to supply the leadership es-

sential in time of peace and imperative in time of war. Regardless of the national dependence upon reserve officers from the college R. O. T. C. units, the military training was of a personal value to the graduate in his later professional career. Here the student was taught discipline, habits of courtesy, devotion to duty, and the foundations of leadership essential for success.

The work at Missouri School of Mines consisted of the basic and advanced phases. Every physically fit beginning student was required to receive two years of training in military science and tactics prior to graduation. Those entering the institution with advanced standing were required to enroll in military for the balance of the time in which they were rated as freshmen or sophomores. A student given advanced standing as a junior and all specials were excused from military requirements. Two hours' credit per semester, or a total of eight hours for the two years was given for completion of the basic course.

Upon completion of the basic course, and if selected by the school director, and by the professor of Military Science and Tactics, as qualified for further training, the student was eligible for the advanced course. In advanced training, three hours' credit per semester were given, making a total of twelve for the two years. Those who satisfactorily completed the four years of training, including one advanced camp, were commissioned as Second Lieutenants in the Engineers Officers Reserve Corps.

Enrollment in the R. O. T. C. increased along with that of total school enrollment. From 214 trainees in 1925, the number had grown to 390 by the 1931-32 term. Then from the depression low of 187 for 1933-34, there was an annual increase until the peak of 534 was reached in the fall of 1940.

The School of Mines administration for the last four years of this period (1937-41) was under the supervision of William R. Chedsey. The Fulton era came to a close on September 1, 1937, ending the longest period of service for any director in the history of the school. The unprecedented growth and expansion of the school during the Fulton leadership assures a prominent position for this directorship in the school's history for the future.

William Ruel Chedsey, who directed the institution's destiny from 1937 to 1941, was a native of the State of Colorado. He was graduated from the Colorado School of Mines with the degree of Engineer of Mines in 1908. He was associate professor at the University of Idaho from 1908 to 1910, during which time he pursued graduate work in Electrical and Mechanical Engineering. After two years of service as a practicing mining engineer, Chedsey returned to teaching and served for three years as associate professor of Mining Engineering at the

Colorado School of Mines. From 1916 to the time of his appointment as director of the Missouri School of Mines, Chedsey was professor of Mining at Pennsylvania State College. He received the honorary degree of Doctor of Science from Colorado School of Mines in 1939.

The two crowning events of the Chedsey Administration were the construction of two new buildings on the school campus. The first of these new edifices was designated as the Hydraulics Laboratory building. The cornerstone of this structure was laid on November 16, 1938, and the edifice was christened Harris Hall. The honor to this veteran professor of Civil Engineering, Elmo G. Harris, was an even greater tribute because of the fact that it was bestowed during his lifetime. At the ceremony, Dr. H. E. Riggs, President of American Society of Civil Engineers, spoke of Harris as "one of the country's most outstanding engineers and teachers."

It had been anticipated that this structure would be completed by September, 1939, but it was September, 1940, before the building was finished and ready for service. Harris Hall as completed, was a three-story building including a basement unit 40 by 120 feet, of reinforced concrete frame construction, faced with native dolomite. It housed the departments of Civil Engineering and Mechanics. In addition, the drafting rooms and offices for the Central Division of the Topographic Mapping Branch of the United States Geological Survey were located in this building.

The second structure, which was completed the closing year of the Chedsey term, was the Chemical Engineering Building. The MISSOURI MINER reported as early as November, 1938, that the school administration was going to petition the next General Assembly for funds to construct a new chemical engineering building. In the spring of 1939, the school appropriation measure with the \$250,000 earmarked for the chemistry building, passed the state legislature. Governor Lloyd C. Stark, however, released only half of the appropriation and only the north portion of the proposed structure was erected.

The Executive Committee of the Board of Curators let the contracts for the construction of the new building on May 10, 1940, and the ground was broken on May 13th. Work on this project progressed rapidly, and by December the structure was virtually completed. The dedication of this significant campus addition was held on April 11, 1941. Addresses were delivered by Governor Forrest C. Donnell, of Missouri; Dr. Harry A. Curtis, Dean of the School of Engineering at the University of Missouri; and Dr. Frank C. Whitmore, Dean of the School of Chemistry and Physics at Pennsylvania State College. President Frederick A. Middlebush, of the University of Missouri, accepted the keys of the building. James A. Potter, of Jefferson City, a member

of the Board of Curators, accepted the building on behalf of the curators.

Two progressive measures adopted during the Chedsey Administration were the raising of entrance requirements for the school and the adoption of a retirement plan for the faculty of the University of Missouri and the School of Mines. The faculty in 1938, raised requirements for high school graduates from two to three units in mathematics. In addition a unit of science was added as a requirement. The increased mathematics requirement however, was modified for superior high school graduates.

The retirement plan for professors was announced by President Middlebush in the fall of 1940. Under the plan, professors, associate professors, and assistant professors, who had been employed for three years were eligible for participation. In effect the plan called for five per cent withholding in salary in which the state matched the five per cent to build up an annuity for retirement at the age of seventy.

The four-year period of the Chedsey Administration from 1937 to 1941, brought a total of 511 Bachelor degrees granted and 19 Masters of Science. The enrollment figure reached the highest levels in the history of the school to that date. The administration opened with 708 the first term, and the closing year witnessed the high figure of 931. Thirty-two professional and four honorary degrees were awarded during this administration.

We must now turn to a brief survey of the development of student activities for the 1920-41 period. This survey as the reader will note covers both the Fulton and the Chedsey Administrations. A detailed account of the many activities is impossible, and those included must be taken up briefly—all out of proportion to their significance in the history of the school.

The General Lectures program, initiated at the school in 1925, constituted an invaluable aid in the educational training of all students. The faculty committee in charge of general lectures was most fortunate in the talent and personages of national fame who participated. As an example of the high quality of the programs, the following distinguished leaders appear on the programs for 1935-36; Dr. Harlan Tarbell, famous magician; Ted Shawn and his dancers; Dr. Barnum Brown, Curator of the American Museum of Natural History; Richard Halliburton, noted author and lecturer; Major Radcliffe Rugmore, lecturer on big game in Africa; and Peter Freuchen, authority on Eskimos of the North.

Athletics at Missouri School of Mines showed a tendency to develop more as an intramural type of training for all students rather than a concentrated effort to produce nationally famous football or basket-

ball teams. The rigid graduation requirements and the high scholastic standards maintained in the institution made it almost impossible for students to devote much of their time to participation in athletics. In spite of these obvious handicaps, Miner teams made enviable records and always displayed a spirit of cooperation and good sportsmanship.

From the standpoint of statistics of games won and points accumulated, the 1925 and 1930 football teams stand out. The 1925 record was reviewed in the MISSOURI MINER as "the most successful season of gridiron warfare for a decade in M. S. M. history." This Miner team bowed to only two opponents, one of them being Washington University by only one touchdown, and the other to one of the great Gwinn Henry teams at the University of Missouri. Miner victims included such schools as St. Louis University, McKendree, Kirksville Teachers, Drury, and Springfield Teachers. The 1930 football team chalked up a record of five victories and only one loss and a tie, but it amassed a point score that was by all odds the best since the miraculous team of 1914. This impressive Miner Eleven Built up a total of 209 points to only 70 for the opposition. Its only defeat was to Tulsa University, and the team was generally characterized by sports writers as the best in the state.

Basketball and track continued as intercollegiate sports. Intercollegiate swimming teams were occasionally organized, and the one in 1937, held competitive meets with Westminster College and Jefferson City Junior College. The period also witnessed a more thorough and effective organization of intramural athletics. Intramural track, swimming, basketball, and handball teams were all engaged in competition. In 1936, intramural wrestling was introduced and this event became one of the most popular contests of the spring season.

In January, 1934, application was made for membership in the Missouri Intercollegiate Athletic Association. This membership became effective with the beginning of the 1934-35 term. In February, 1921, the M Club was formed in which all athletes who had won letters in football, basketball, and track, were eligible for membership. The purpose of the club was to bring athletes closer together and to increase the incentive to win a letter. It attempted to create more student support and enthusiasm in all branches of athletic activity.

An organization giving active support to the athletic program was the Booster Club. This society had many worthy objectives, and one of them was to loan money to needy athletes. The financial program of the organization seemed very successful, from the beginning when about \$2,000 was pledged for the first year from students, clubs, fraternities, alumni, and townspeople. The Booster Club was formed in September, 1922, and during the first year loaned about \$1100 to

athletes. Other Booster objectives included taking pictures at football games for publicity purposes; encouraging the alumni to exert all possible efforts to put the school on the map; planning tours for the Glee Club and Orchestra; and the erection of a sign near the Frisco Station to remind travelers that Rolla was the home of Missouri School of Mines.

The student society that appears to have contributed materially to the extra-curricular life of the school was the M. S. M. Players. The organization was formed in 1920, and for the first year was known officially as the Star and Garter. In the fall of 1921, the Star and Garter gave way to the new organization known as the M. S. M. Players. Its basic purpose was the promotion of dramatic performances and use of the funds for school activities. Special emphasis was given business efficiency, and during the first year and a half the Players produced five plays and contributed over \$1,000 to various student organizations. The junior class, Booster Club, ROLLAMO Board, and the Athletic Association were their chief beneficiaries.

The Players in April, 1934, applied for membership in the Alpha Psi Omega national honor dramatic fraternity. By May of the same year, the School of Mines group had been accepted as the Delta Pi Cast. Membership in the local chapter was limited to students and faculty of the school who had taken part in two plays and to persons who, because of their extraordinary interest in dramatics, were granted honorary membership.

With approximately twenty members present to form the organization, the Miner Band came into existence on September 17, 1926. On October 1, the band gave its initial performance in Parker Hall which was described as a marvelous success. Credit for the success of this organization was largely due to the efforts of its director, John W. Scott. During the 1928-29 school year, it was organized as the military band, and it became a part of the R. O. T. C. The government furnished the instruments and music. The band performed a distinctive service in promoting school spirit, as an aid to the R. O. T. C. program, and as a means of school publicity at football games, concerts, and other public occasions.

The Glee Clubs were not permanent organizations over the entire period. The first club was formed in the fall of 1921, with about twenty-five members. A Mandolin Club was organized as an auxiliary. This club gave a concert for the benefit of Saint Patrick's celebration, the following spring. It seems to have become inactive about 1923. Another club, directed by James Cullison professor of Geology, was very active by the time of the 1931-32 school term. These song "artists" gave a concert at William Woods College, Fulton, Missouri, on

February 8th; and at Springfield, Missouri, Teachers College, the following April, as well as successful home appearances. Unfortunately, this fine organization was not permanent, and, with the severity of the depression and the declining enrollment, the club disbanded. Other attempts were made before a more permanent Glee Club was formed in the 1940's.

The faculty and administration remained alert and informed on the changes and the developments in the engineering profession through the encouragement of student chapters in the national professional engineering societies. The Missouri Mining and Metallurgical Association was the oldest of the professional engineering societies on the campus dating back to 1893. In 1921, it became affiliated with the American Institute of Mining and Metallurgical Engineers.

The School of Mines Chapter of the American Society of Civil Engineering was organized in November, 1923. At first, it was limited to junior and senior civil engineering students, but has since been extended to freshmen and sophomores who intend to earn a degree in the field. The society promotes programs with well-recognized speakers, thus showing the relationship between theory and practice through experience of others.

The School of Mines Chapter of the American Institute of Chemical Engineers was known as the Ira Remsen Society from 1924 to 1939. After 1939, it was known as the American Institute of Chemical Engineers. It was composed of the students in Chemical Engineering, and the faculty and research staffs on the campus interested in the field.

The junior and senior students of the Ceramic Engineering department installed the Orten Society on September 18, 1928. The organization was named for Major Edward Orten, Jr., one of the early leaders of the industry in the United States. Membership in the society was limited to those specializing in ceramics. In the fall of 1939, the name of the society was changed to the Missouri School of Mines and Metallurgy Branch of the American Ceramic Society.

The student branch of the American Institute of Electrical Engineers was approved in March, 1925. The general purpose of the organization is to stimulate an interest and to advance and disseminate knowledge in the field of electrical engineering. Membership in the society was limited to seniors, juniors, sophomores and members of the teaching staff in the Electrical Engineering department.

The local chapter of the American Society of Mechanical Engineers was organized early in 1930. Its objective was to further the study of Mechanical Engineering and to promote good fellowship among members.

In October, 1937, the student chapter of the American Society of Metals was established on the campus. Membership was confined to junior and senior students in Metallurgy and those graduates directly connected with the metal industry.

The Missouri School of Mines Post of the Society of American Military Engineers was installed in the fall of 1937. The objects of the society were to encourage a feeling of mutual cooperation and friendship among the students in the R. O. T. C., to discuss papers of interest to those in the field, and to promote the general interest of the Reserve Officers' Training Corps. One of the most significant activities was to sponsor the annual military ball.

The institution's chapter of the Missouri Academy of Science grew out of an informal freshman scientific discussion club that was formed in the fall of 1931. This discussion club affiliated with the Missouri Academy of Science in April, 1938, and has remained a member of the college section to date. This society provided a real opportunity for freshmen to discuss problems of scientific interest.

The engineering scholarship fraternities, Tau Beta Pi, and Phi Kappa Phi, were installed at the opening of the period. In the fall of 1925, the University of Missouri chapter of Sigma Xi extended the privilege of membership to candidates nominated from Missouri School of Mines. The local membership of Sigma Xi then organized on this basis.

The professional engineering fraternity, Theta Tau, continued as an active organization. The professional Chemical fraternity, Alpha Chi Sigma, installed its Beta Delta Chapter at Missouri School of Mines on May 2, 1936. The objects of this fraternity were threefold: to bind its members in a tie of true and lasting friendship, to strive for the advance of chemistry both as a science and as a profession, and to aid its members in the attainment of their ambitions as chemists.

The year, 1933, brought the organization of the outstanding service fraternity, Blue Key. This is primarily a service organization and it is to be commended for its many projects for the evolution of a greater School of Mines. Its many service activities, such as conducting visitors about the campus, broadcasting football games, compiling student directories, and other worthy activities, gave it the title of the College Rotary Club. A student was eligible for initiation at the end of the sophomore year providing he had an average scholastic record and was active in campus activities.

The Beta Omicron Chapter of Alpha Phi Omega, a national service fraternity, was organized at the school in the spring of 1939. The chapter accepted any student with average scholastic attainments, who at any time had received training with Boy Scout organizations. It

was essentially an organization for promoting general advancement and progress of the school.

The five social fraternities which were in existence in 1920, had increased to nine by the close of the period in 1941. The first of the social fraternity additions after 1920, was the formation of Triangle. The school chapter of Triangle was installed on December 10, 1927, as the successor to the Grubstakers Club. It will be recalled that the Grubstakers was the oldest of the eating clubs with its organization dating back to 1902. On April 29, 1933, the Prospectors, which had been a local fraternity and eating club for twenty years, was installed as the Alpha Iota Chapter of Sigma Pi Fraternity. The installation service was held in the Parish House of the Episcopal Church, with many visiting officers and members of the fraternity present.

The last two of the social fraternities founded were Alpha Lambda Tau and Theta Kappa Phi. The Phi Chapter of Alpha Lambda Tau was initiated on the campus on March 16, 1935, but the fraternity did not become active until the fall semester of that year. This organization was the successor of the Bonanza Club, which had been in existence at the school since 1914. The Mu Chapter of Theta Kappa Phi was installed on the campus on November 29, 1935, when the Mercier Club was granted a chapter in the national Catholic fraternity. The installation ceremonies extended over a period of four days. Director Fulton welcomed the new fraternity to the school and highly commended the past record of the Order of Cardinal Mercier.

The Interfraternity Council was first given recognition in the 1931-32 catalog. It consisted of one representative from each of the social fraternities. Its principal aim was to preserve harmony and promote a spirit of mutual friendship and cooperation among all members of fraternities, so as to promote the best interests of Missouri School of Mines.

The non-fraternity students of the school organized under the name of Independents. Formed about 1935, the major objective was to enable non-fraternity men to participate more fully in student activities. Any student not a member of a fraternity was eligible for membership.

In the fall of 1940, the coeds on the campus organized the Pi Delta Chi Sorority. A Coed Association was in existence before the formation of this society.

Toward the close of the period three eating or cooperative boarding clubs were formed. By organizing on a cooperative basis the clubs

were able to maintain a higher standard of living for their members at relatively low costs. The first of these, the Engineers Club, was founded in 1934. The second known as the Shamrock Club was organized in 1938, and the third, the Tech Club, was founded the last year of the Chedsey Administration, 1940-41.

In 1937, the present Student Council of Missouri School of Mines was founded. This council became an efficient governing body, and has existed to the present. The Council consisted of one representative from each social fraternity, and an equal number from the non-fraternity students. While the primary purpose of the Council was to provide official contact between the faculty and student body, it also administered school activities through the appointment of committees on dances, general lectures and St. Pat's.

Engineers' Day became an established event at the school on April 1, 1938. The initiation of this significant school activity was held in conjunction with the annual meeting of the Missouri Academy of Science. The MISSOURI MINER carried the headline report on April 27, 1938, that 1700 visitors were on the school campus for the day's celebration. Impressive exhibits were presented by the departments to enlighten the guests on the nature of work done at the school. Thus was initiated a special event that was destined to become traditional.

Parents' Day emerged as a celebration in the fall of 1939, as an adaptation of a former activity known as Dads' Day. Dads' Day was so well attended in 1938, and so many expressions of appreciation were received by both the fathers and the mothers, that it was decided to broaden the event to include the two parents. The first Parents' Day celebration was held on October 21, 1939, with 500 guests attending. The following year witnessed an even greater Parents' Day. This marked another school activity which was established for the greater interest in Missouri School of Mines.

The eventful period from 1920 to 1941, came to a close with the resignation of Director Chedsey, which was effective August 31, 1941. This period including the Fulton and Chedsey Administrations, was a most remarkable era of growth, expansion, broadened training, and wider service in the history of Missouri School of Mines and Metallurgy.

ENROLLMENT BY CURRICULA

1920 - 1941

<i>Year</i>	<i>Min- ing</i>	<i>Met.</i>	<i>Civil</i>	<i>Mech.</i>	<i>Elect.</i>	<i>Chem.</i>	<i>mic.</i>	<i>Gen.</i>	<i>Sci.</i>	<i>Unc.</i>	<i>Total</i>
1920-21	146	27	24	8	8	18	..	124	7	58	420
1921-22	218	40	51	12	15	22	..	..	3	66	427
1922-23	176	42	58	10	16	17	..	..	6	34	359
1923-24	147	32	74	11	35	19	..	..	6	39	363
1924-25	131	20	79	17	38	30	..	26	22	36	399
1925-26	127	20	84	24	46	35	..	18	22	32	408
1926-27	122	18	93	30	66	38	15	9	22	33	446
1927-28	117	21	112	35	74	45	29	16	16	40	505
1928-29	102	27	138	39	64	57	31	43	19	16	536
1929-30	96	31	126	47	62	63	39	47	20	22	553
1930-31	116	60	132	70	79	68	35	26	13	37	636
1931-32	83	64	161	83	79	91	29	33	19	38	680
1932-33	63	55	129	76	47	69	22	15	20	33	529
1933-34	43	28	88	57	47	55	16	13	13	25	385
1934-35	64	30	94	55	48	67	12	15	6	24	415
1935-36	65	33	100	61	48	75	15	15	5	30	447
1936-37	80	45	104	77	66	75	10	44	6	25	532
1937-38	126	92	101	109	85	98	14	42	8	33	708
1938-39	176	120	85	123	104	101	26	29	10	39	813
1939-40	203	104	105	158	105	111	35	27	10	39	897
1940-41	192	109	101	178	105	141	35	35	7	28	931

ENROLLMENT BY CLASSES

1927 - 1941

<i>Year</i>	<i>Freshmen</i>	<i>Sopho- mores</i>	<i>Juniors</i>	<i>Seniors</i>	<i>Graduate</i>	<i>Unclasi- fied</i>	<i>Totals</i>
1927-28	188	106	86	71	14	30	505
1928-29	214	121	91	76	18	16	536
1929-30	222	122	106	74	15	14	553
1930-31	206	163	128	97	19	23	636
1931-32	201	143	158	123	17	38	680
1932-33	103	133	110	136	16	31	529
1933-34	69	83	95	102	14	22	385
1934-35	98	78	98	95	27	19	415
1935-36	145	89	87	90	13	23	447
1936-37	172	128	103	95	16	18	532
1937-38	248	167	150	98	18	27	708
1938-39	254	200	179	127	22	31	809
1939-40	244	234	201	167	18	32	895
1940-41	268	215	230	177	19	22	931

BACHELOR'S DEGREES GRANTED

1920 - 1941

Year	Mining Eng.	Met. Eng.	Civil Eng.	Mech. Eng.	Elect. Eng.	Chem. Eng.	Ceramic Eng.	Gen. Science	Total
1921	41	9	2	..	3	9	..	3	67
1922	45	10	6	2	2	2	..	1	68
1923	56	15	7	1	1	6	..	2	88
1924	18	12	11	1	2	..	..	..	44
1925	21	7	17	4	5	8	..	2	64
1926	24	3	10	1	6	7	..	3	54
1927	27	4	15	3	3	7	..	3	62
1928	24	4	16	4	9	2	2	4	65
1929	17	8	12	6	11	5	2	2	63
1930	16	2	19	2	10	2	9	3	63
1931	19	5	28	8	9	8	7	2	86
1932	16	10	27	12	13	17	6	2	103
1933	16	20	32	14	7	10	8	6	113
1934	12	9	24	13	8	17	4	3	90
1935	9	7	20	14	16	12	3	2	83
1936	16	7	21	9	8	10	6	3	80
1937	18	5	30	12	9	12	3	1	90
1938	22	11	23	10	16	12	..	..	94
1939	21	13	18	15	17	27	2	2	115
1940	49	27	17	18	19	16	6	1	153
1941	33	19	23	27	17	17	10	1	147
Totals...	520	207	378	176	191	206	68	46	1,792

MASTERS OF SCIENCE DEGREES GRANTED, 1921-1941

Year	Mining Eng.	Met. Eng.	Civil Eng.	Mech. Eng.	Elect. Eng.	Chem. Eng.	Ceramic Eng.	Gen. Science	Total
1921	3	..	..	..	..	2	..	3	8
1922	3	2	..	..	..	2	..	2	9
1923	1	2	2	..	..	..	..	2	7
1924	..	3	2	..	..	2	..	..	7
1925	4	..	..	..	..	..	..	..	4
1926	2	2	2	..	..	..	..	..	6
1927	3	1	..	..	..	2	..	..	6
1928	3	..	..	..	..	5	..	..	8
1929	6	1	..	..	..	2	..	..	9
1930	..	3	..	..	..	3	..	2	8
1931	..	1	..	..	..	1	..	6	8
1932	..	2	2	..	..	3	..	2	9
1933	..	..	..	..	..	3	..	4	7
1934	..	..	..	..	..	2	..	..	2
1935	..	..	..	..	..	1	..	..	1
1936	..	1	..	..	..	1	..	..	2
1937	..	..	..	..	..	1	..	..	1
1938	..	..	..	..	..	2	..	4	6
1939	..	..	2	..	..	..	..	1	3
1940	..	1	1	..	..	2	..	2	6
1941	..	..	..	..	..	2	..	2	4
Totals...	25	19	11	..	..	36	..	30	121

PROFESSIONAL DEGREES GRANTED, 1921-1941

<i>Year</i>	<i>Mining Eng.</i>	<i>Met. Eng.</i>	<i>Civil Eng.</i>	<i>Mech. Eng.</i>	<i>Elect. Eng.</i>	<i>Chem. Eng.</i>	<i>Ceramic Eng.</i>	<i>Gen. Science</i>	<i>Total</i>
1921	7	2	1	..	..	..	..	..	10
1922	3	2	4	..	..	..	..	..	9
1923	5	1	..	1	..	..	..	..	7
1924	4	2	1	2	1	1	..	..	11
1925	6	2	1	..	..	1	..	..	10
1926	3	..	..	..	..	..	..	..	3
1927	12	1	..	..	..	4	..	..	17
1928	4	..	1	..	..	..	..	..	5
1929	1	2	..	..	..	2	..	..	5
1930	7	2	3	..	..	..	..	..	12
1931	2	2	2	..	1	2	..	..	9
1932	1	1	8	..	..	..	..	..	10
1933	1	..	3	..	..	..	..	..	4
1934	4	..	4	..	..	1	..	..	9
1935	7	1	5	..	1	..	..	..	14
1936	3	..	..	..	..	..	1	..	4
1937	1	..	4	..	..	1	..	..	6
1938	6	..	5	..	..	..	..	..	11
1939	5	..	3	..	2	..	..	..	10
1940	2	..	1	1	..	..	..	..	4
1941	3	1	..	..	..	3	..	..	7
Totals...	87	19	46	4	5	15	1	..	177

CHAPTER VII
DEAN CURTIS LAWS WILSON
and
THE PRESENT MISSOURI SCHOOL OF MINES
1941—1946

The present Dean, Curtis Laws Wilson, who has so efficiently and successfully administered the School of Mines' affairs for the past five years, assumed his duties on August 1, 1941. Dr. Wilson for twenty years previously, was affiliated with Montana School of Mines, at Butte, Montana, and for thirteen years served as Professor of Metallurgy and headed the department at that institution.

Dean Wilson was born and reared in Baltimore, Maryland, and was graduated from the Baltimore City College in 1916. He then moved to Montana where he was graduated from the Montana School of Mines in 1920. After service for a year with the Anaconda Copper Company at Butte in various capacities, Dr. Wilson joined the faculty of the Montana School of Mines as instructor in Metallurgy, and was later advanced to the position of head of that department.

In 1928, after twenty-seven months of study in Europe, Wilson was awarded the degree of Doctor of Philosophy, Magna Cum Laude, from the University of Goettingen, in Germany.

Dr. Wilson was active in civic and community affairs at Butte, and in problems of a statewide character. He was particularly prominent in the fight against tuberculosis, and served as First Vice-President of the Montana State Tuberculosis Association.

In addition to his service to the state in the realm of civic affairs, he was likewise prominent in the professional engineering societies. His membership included the American Institute of Mining and Metallurgical Engineers, the American Chemical Society, and the Montana Society of Engineers. He served for one year as chairman of the Montana section of the American Institute of Mining and Metallurgical Engineers.

Dean Wilson was also well-known as the author of numerous articles in the field of Metallurgy. At the time of his appointment, in 1941, he had in the hands of his publishers, a book dealing with the metallurgy of copper.

The MISSOURI MINER for September 17, 1941, was dedicated to the new dean. As an expression of best wishes from the students, the MINER had this to say: "We hope that your stay here will be

a long, pleasant, and prosperous one, and we pledge ourselves to do everything in our power to make it so."

The ROLLAMO for 1942, at the close of Dr. Wilson's first year in office, carried the following appropriate tribute in recognition of his ability and leadership:

"Dean Wilson has ably proven himself as being the 'man for the job' during his first year in office. Through his energetic and magnetic personality he has won the confidence and support of both the faculty and student body, and with such an excellently qualified man as our Dean we may rest assured that M. S. M. will keep on the road to progress in engineering education."

President Middlebush, in the M. S. M. ALUMNUS, expressed emphatically the faith and confidence of the university administration in the future of the school under the leadership of Dean Wilson. The following quotation is from the President's article:

"Dean Wilson, a well-known Metallurgist, who was appointed after a careful and thorough canvass of the field, is rapidly becoming acquainted with Missouri and the School of Mines, particularly. We believe that genuine and sound progress will be made under his administration."

A new spirit of cooperation and mutual friendliness was exhibited soon after the inauguration of Dean Wilson. This new spirit of progress was nowhere more clearly demonstrated than in the reciprocal efforts of the School of Mines and the divisions of the University at Columbia to work in harmony for the progress and glory of the entire University. Because of this cordial relationship, it has been possible to render greater service to the state and its citizens.

In his first address to the student body on September 12, 1941, Dean Wilson gave a brief insight into the education philosophy that has been predominant during his administration. The keynote of this philosophy was that above all the educational institution exists for the benefit of the students. All of his administrative policies have been formulated for the greater interest of all students. The campus, physical plant, and other material characteristics, have been considered secondary to the faculty in the make-up of the real institution. The principles of democracy upon which the school has operated under this administration are therein elaborated. As to the characteristics of the successful student, the Dean emphasized the following traits: honesty, avoidance of mediocrity, loyalty, ability to get along with people, physical development, social development, and spiritual development.

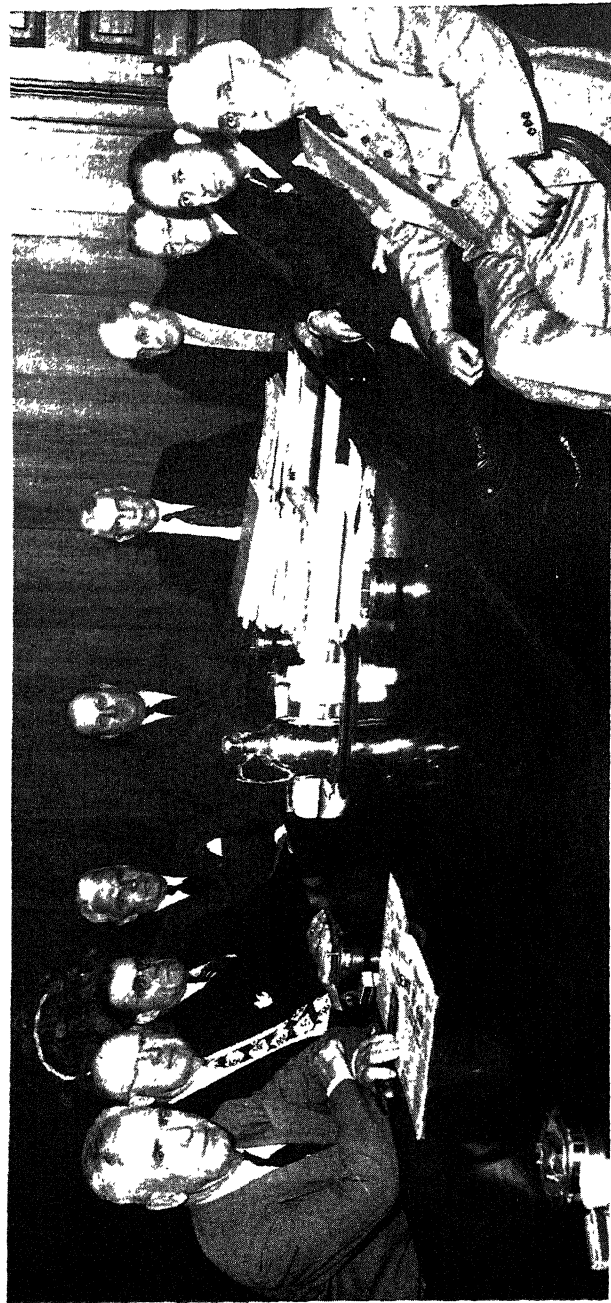
Soon after his appointment, Dean Wilson won the unanimous support of the student body and the hearty cooperation of the faculty. The Dean entered upon his duties with such efficiency and zeal that



FREDERICK A. MIDDLEBUSH, PRESIDENT OF THE UNIVERSITY OF MISSOURI



CURTIS LAWS WILSON
PRESENT DEAN OF MISSOURI SCHOOL OF MINES



BOARD OF CURATORS OF THE UNIVERSITY OF MISSOURI, 1946

Reading from left to right: ROSCOE ANDERSON, JOHN H. WALPERS, FRANK C. MANN, STRATTON SHARTEL, HAROLD J. MOORE, ALLEN McREYNOLDS (PRESIDENT OF BOARD), FREDERICK A. MIDDLEBUSH, LESLIE COWAN (SECRETARY TO BOARD), DAVID W. HOPKINS, JAMES A. POTTER, GUY A. THOMPSON, MEMBER OF BOARD, NOT PICTURED.

the institution gave every promise of entering another period of prosperity and service greater than any previous era in the history of the school. Unfortunately, Dean Wilson had been in office for only four months when the Pearl Harbor disaster threw the nation into the Second World War. This war, which endured for almost four years, made it extremely difficult, temporarily, for Dean Wilson to carry out his excellent ideals for a greater School of Mines. The fact that the institution maintained its traditional high standards of instruction, heroically served the war effort, and formulated preparations for a greater future, is a remarkable tribute to the present administration.

A problem similar to that of April, 1917, faced the students at Missouri School of Mines following the disastrous attack on Pearl Harbor on December 7, 1941. At first the tendency was to enlist immediately under the colors as a wave of patriotism swept the students. Dean Wilson, however, urged the students to remain in school and complete their training as quickly and efficiently as possible rather than to enlist before the nation had asked for their services. While the Dean did not discourage the enthusiasm of any student stimulated by conscience to take up arms for his nation, he effectively pointed out that in this war involving technical processes there would be a critical demand for engineers and scientists. The students were told that their service to the war effort and hence to their nation, would be materially enhanced by a completion of their training. Most students perceived the logic in this reasoning and remained in school to join some reserve training program or to complete work for a degree and then give to their country the technical knowledge so urgently needed in a total war.

One of the early policies adopted by the administration and faculty, devoting greater service to the nation at war, was the acceptance of the accelerated program for speeding up the training process. After a poll of the students was taken and 442 to 120 voted that they would be willing to attend the summer session, the faculty immediately considered the problem. In February, 1942, the teaching staff adopted an accelerated program for the duration of the conflict. This made it possible for beginning students to complete the regular four-year college course in three years by attending three full years of two semesters each plus three summer sessions. In addition to the regular fall and winter semester and the spring semester of eighteen weeks each, a twelve weeks summer session, at which two-thirds of the requirements of a regular semester could be completed, was included. While the program was accelerated, the faculty guarded zealously the high academic standards which had always been maintained as the policy of the school.

As in the case of the First World War, the facilities of Missouri School of Mines were again dedicated to the nation as a service for

winning the war. An Engineering Defense Program was adopted at the school as early as February, 1941. Three programs were offered in this training, including engineering drawing, materials testing, and machine design. The purpose was to provide technically trained personnel for the military and defense industries. A total of 209 students were enrolled in this training program for the year 1941, and, by 1942, the first contingent was already serving in war industries.

In the summer of 1942, the program became known as the Engineering, Science, and Management War Training Program. The program was conducted in cooperation with the United State Office of Education, the purpose of which was to provide technically trained personnel for the military services and war industries. These courses were of college grade, but no credit toward a degree was granted. Beginning in June, 1942, six programs were offered. These programs included: drafting, both basic and advanced; materials inspection and testing; machine and tool design; radio technician training; topographic mapping and photogrammetry; and economic mineralogy. Certificates were issued upon the satisfactory completion of any one term. The director of the Defense Training Program was Professor E. W. Carlton, of the Civil Engineering department.

This war-training program, which was conducted from February, 1941, through the summer of 1943, gave instruction to a total of 830 students. The contributions of these trained technicians to the winning of the war cannot be overestimated.

The Civil Pilot Training Program was another effective and popular war-effort activity at Missouri School of Mines. This program, which was instituted in October, 1939, turned out a total of 352 pilots for the armed forces by the time the program was terminated in April, 1943. It was reported that many of those who had completed the training served in the armed forces as combat pilots and transport pilots, and others served as aviation instructors. Dr. A. J. Miles was the co-ordinator of this training program.

Another group of Missouri School of Mines trainees, who prepared for special service in communications, were known as the Signal Corps Trainees. This training was initiated on September 21, 1942, with an enlisted roll of fifty-six trainees. The course was known as the Pre-Radar course and consisted of training in mathematics, circuit theory, electronics, and radio communications. The work was under the supervision of the Electrical Engineering department, supplemented by the Mathematics department. The enrollees received certificates upon completion of the training. The first group completed their training in December, 1943, when a second contingent arrived. On April 3, 1943, the second Signal Corps Contingent of 103 members received

their certificates at a convocation in Parker Hall that was in reality a commencement. Dean Wilson was the principal speaker at this convocation.

Many students at Missouri School of Mines enrolled in the various reserve training programs in the fall of 1942. The first group called to active duty were those enlisted in the Army Air Corps, when twenty-five men received their orders to report in February, 1943. But the major war contribution of the Miner Reservists came in June, 1943, when a total of 226 students were called to active duty under the various enlisted reserves. The majority of these were in the army enlisted reserve, although a goodly number were in the Navy and Marine Corps.

The rapid expansion of the United States Army in a day which called for mechanized equipment required that a majority of the recruits be specialists in the many technical phases of warfare. This made it mandatory to call upon training facilities of the American colleges in order to supply the specialized personnel needed for such a war. Early in 1943, the War Manpower Commission made public an initial list of universities and colleges eligible for the training needs in this specialized field. The School of Mines was selected to train specialists for the army in both the basic and advanced units under the engineering division.

The Army Specialized Training Program was inaugurated at the school on August 9, 1943. The campus garage was remodeled into a mess hall. The warehouse and the top floor of Mechanical Hall were converted into barracks. Three terms consisting of twelve weeks each for four hundred trainees were established. Since the school was selected for both basic and advanced training under the engineering division, the work included general basic, surveying, internal combustion engines, and communications. Courses in chemistry, engineering drawing, English, geography, history, mathematics, and physics made up the basic phase. The military program was conducted by commissioned and noncommissioned officers of the army.

The basic phase of the program, consisting of three twelve-week terms, was roughly equivalent to one year of college work. Presumably, upon completion of the basic phase, those students whose further training and skill the army considered imperative, would enter advanced work. Others would be detailed back into the army with a special rating, or would enter officers' candidate school. The faculty, on October 5, 1943, voted to accept Army Specialized Training Program (A.S.T.P.) courses for regular college credit. The acceptance of this credit from other institutions was likewise approved.

The A.S.T.P. was terminated at the School of Mines on April 29, 1944. This marked the conclusion of three terms of the basic

phase. An advanced program also in operation by this time was discontinued by the army. The trainees were detailed to posts of duty in the armed forces to apply the principles acquired at the school and thus contributed in no small measure to the ultimate triumph.

Another program of great importance to the war effort on the campus was the research carried on by the United States Bureau of Mines Ore Dressing Station in cooperation with the State Mining Experiment Station. This work was directed largely toward the recovery of strategic war materials from low-grade deposits. The research was especially directed on methods for the beneficiation of domestic manganese ores.

The Topographic and Mapping Section of the Geological Survey and the Water Resources Branch also carried on extensive research on behalf of the war effort.

In cooperation with the accelerated program producing critically needed graduates for the war effort, the faculty on November 10, 1942, reduced graduation requirements from 150 to 144 credit hours plus the required work in military and special lectures. This was to be operative for the duration of the war, or until February 1, 1945. On the latter date, the requirements were to revert to the old system of 150 hours.

Shortly after the action by the faculty reducing graduation requirements, the Selective Service Director issued occupational bulletin number 11, which provided for the deferment of engineering students who could complete their training before July 1, 1945. Under the arrangement, just mentioned those students who entered the school in September, 1942, would graduate in August, 1945, and therefore could not be recommended for deferment. The faculty accordingly, on March 17, 1943, extended the 144 hours graduation requirement for the duration. This action placed the freshman class of that year under the occupational bulletin.

It might be stated that after the end of the "shooting war" in August, 1945, the faculty voted to return to the old graduation requirement of 150 hours plus the requirement in military.

At a special educational conference at Jefferson City, Missouri, on December 18, 1942, certain recommendations were made advocating lower entrance requirements for colleges. On May 4, 1943, the School of Mines faculty adopted the recommendations of the conference which provided among other things, that students specifically recommended by their high-school principals, who had completed the equivalent of three and one-half years of their work and who ranked in the upper third of their class, be admitted to the school.

The high scholastic requirements for which Missouri School of Mines has been noted in the past, were further elevated on May 16, 1944, when the faculty raised the grade-point average required for the degree. One might note that this action was taken before the end of the war, when the enrollment was still limited. The new provision raised the grade-point requirements for graduation from 0.75 to 1.00. This change was effective with the fall semester of 1944. However, under the new system a grade of F did not inflict negative grade points. Grades other than F carried the same number of points as formerly. This did constitute a distinct raising of academic standards.

Another faculty action taken before the close of the war, provided for a more drastic policy in regard to unexcused absences from class. A regulation, effective March 7, 1945, limited a student who had received a negative hour by reason of unexcused absence other than for holiday cuts or late registration, to five unexcused absences for the remainder of that semester. Those on probation incurring penalties under the rule were regarded as violating their probation and were subject to immediate dismissal. The rule showed that in the new post-war era, the faculty was in no disposition to tolerate negligence or inefficiency on the part of the students.

One of the first curricular changes of the Wilson Administration was to reduce the freshman course entitled "Special Lectures" from two to one hour per week. Also, under the new change, no credit hour was to be given for the lecture. In view of the anticipated record enrollment in the fall of 1946 and because of other administrative difficulties, the faculty in August of that year voted to abolish the freshman requirement in Special Lectures.

Other progressive curricular and administrative changes under the Wilson administration were the consolidations of departments. At a meeting of the Board of Curators, on April 22, 1942, the department of History, Psychology, and Biology was abolished. The courses in biology, bacteriology, and sanitation were added in the department of Civil Engineering. Courses in personnel management, history, and psychology were included in the department of Economics. Then, beginning on September 1, 1942, the department was designated as the department of Economics and History.

In September, 1941, Dean Wilson appointed a Committee on Rules and By-Laws to make a study of the rules, and a committee to revise the catalog. On October 20, 1941, the special committee on the catalog met and recommended a thorough revision of the school bulletin by making it more coherent and streamlined. The changes recommended and approved made the catalog material more concise and understandable. The improvements are visible by an examina-

tion of the 1943-44 catalog when compared with that for 1940-41. A more effective method of listing faculty members was adopted. The names of secretaries, clerks, and departmental assistants were eliminated. A re-writing of descriptions of buildings was recommended to bring the information up-to-date. In addition, the catalog material on the Experiment Station and the Missouri Geological Survey was revised.

Catalog improvements have continued throughout the Wilson term. Effective June 1, 1944, was a new numbering system for courses. The old system, which had been adopted at the beginning of the Fulton Administration, was replaced by one conforming more nearly to that in use by the other divisions of the University. The new system brought a more clarified distinction between freshman, sophomore, upperclass, and graduate courses. Beginning in 1945, departmental write-ups for the degree-granting work was transferred from the section on departments of instruction to the division on curricula.

The Committee on By-Laws in 1942, made a thorough study of the rules and regulations and presented its recommendations. Certain faculty committees were abolished and their work transferred to others. The Committee on Graduate Students was thenceforth known as the Committee on Graduate Study and Advanced Degrees. The Committee on Student Activities, and the Committee on Educational Problems were abolished. The activities of the former largely went to the Dean, while those of the latter were transferred to the Committee on Policy. The registrar was made secretary ex-officio of the faculty. These changes and others which were instituted all made for a more thorough, efficient, and centralized administration of the affairs of the school.

Missouri School of Mines was most fortunate in that its enrollment maintained a high total up to the closing year of the war. In fact, the 958 students for 1942-43, represented a record high for the history of the school. The low for the war years came during the 1944-45 term, when the student body dropped to 308, the smallest since the First World War. This low number was only temporary, as the close of the war brought a rapid increase, which by the 1945-46 term had already equalled 905. With the returning veterans and others seeking an engineering education, coupled with the growing demand for engineering training in the post-war era, enrollment was expected to surpass 2,000 for the fall of 1946. This would constitute the largest student body in the 75 year history of the school.

The opening year of the Wilson Administration, 1941-42, found the largest senior class in the institution's history, with 219 members. This was reflected in a large graduating class in May, 1942, when 188 seniors received degrees, the greatest number for any commencement

to that date. This exercise was held in the Uptown Theatre, which had a seating capacity greater than could be provided in any building on the campus. The commencement speaker, Dr. Clinton H. Crane, President of the St. Joseph Lead Company, was awarded the honorary degree of Doctor of Engineering. As in the case of enrollment, the number of succeeding graduating seniors remained large down to 1945. The fact that 584 Bachelor of Science degrees were granted during the war years was a national contribution of which the school may well be proud. With those graduates offering their engineering knowledge to the armed forces and applying their critically needed skills to war industry, the school had achieved a meritorious record by the close of the conflict.

While Dean Wilson expressly emphasized the fact that buildings do not make an institution, he was perfectly aware of the need for the expansion of plant facilities to cope with the growing postwar enrollment. A planning committee was appointed before the close of the war to draw up plans for needed buildings when the funds for such construction would be available. A Board of Visitors, in its report to outgoing Governor Forrest C. Donnell, in January, 1945, recommended an expenditure of \$4,150,000 for fifteen new buildings at the School of Mines. Some of the structures proposed were: dormitories, a mining building, ceramics building, a mineral industries building, an auditorium, mechanical engineering building, electrical engineering building, R.O.T.C. Armory, a new infirmary, and a student union. In addition it called for the completion of the chemistry building, and needed repairs on other buildings. While the possibility of the school receiving all these structures at one time was recognized as being remote, the report does show the recommendations for the plant expansion of the future School of Mines.

The outbreak of the war in 1941, and the resulting demands for war materials, made a vast building program impossible. Nevertheless, when the struggle broke out, the General Assembly had already made an appropriation for the erection of a new heating and power plant at the School of Mines. The need for this new plant had been recognized for some time, and the Board of Curators had recommended an appropriation for it as early as April, 1940. The State Legislature appropriated \$225,000 in June, 1941, and it was anticipated that the structure would soon be erected. Meanwhile, with the nation at war, the matter of the construction of such a unit became a conjecture.

President F. M. McDavid, of the Board of Curators, announced in January, 1942, that a priority rating had been secured for the boilers and equipment for the plant. Then difficulty arose when none of the companies bidding could promise delivery of the boilers and turbines

within a year and some even placed two years as the probable delivery date. When it became apparent, in the summer of 1942, that the materials essential for the new plant could not be obtained, arrangements were made to recondition the equipment in the old plant for the succeeding winter. By the fall of 1942, it was evident that the materials for constructing the unit would likely not be available until the close of the war and that the school would be forced to operate with the old facilities.

Finally, with the tragic war drawing to a close, the Missouri General Assembly in the summer of 1945, appropriated \$225,000 for the completion of the plant. In anticipation of this appropriation, President Middlebush, Vice-president Leslie Cowan, and Dean Wilson, formulated the plans for the plant to the extent that work was initiated in the fall of 1945. It was obvious by the spring of 1946, that the first allotment would not be sufficient to complete the construction, and provide for the essential equipment. Again the legislature showed its generous policy toward the school, and on July 25, 1946, Governor Phil M. Donnelly signed the measure which carried funds for the completion of this badly needed campus structure. It was planned to have this new power and heating plant in operation for the winter season of 1946-47.

The appropriation measure passed by the General Assembly and signed by the governor in July, 1946, also carried a fund of \$262,500 for the erection of a dormitory. This allotment was to be matched by an equal amount raised by issuing and selling revenue bonds on the proposed structure, making a total of \$525,000. This contemplated structure was supposed to provide beds for three hundred men and aid materially in alleviating the housing shortage. After the appropriation was voted, construction costs continued to mount, and it became necessary to plan for a two hundred man dormitory instead of the three hundred man unit as previously anticipated. It was planned to erect this new dormitory on the lot behind the school hospital and construction was to begin at an early date. The School of Mines seemed to be on the threshold of the greatest plant expansion in its history.

The institution under the efficient leadership of Dean Wilson, in the spring of 1944, began to make thorough preparations for the training of the returning veterans of World War II. In April of that year the Dean appointed a Veterans Curricula Committee to plan a program of studies for the returning soldier. This committee, under the chairmanship of Professor E. W. Carlton, outlined a number of short courses designed specifically for those veterans who for time or other factors could not complete the full four-years course required for a degree. This committee designed a special program, and at a special

faculty meeting on August 7, 1944, gave a detailed report of the plans completed to that date. At this special meeting four representatives from the Veterans Bureau addressed the faculty on the legislation passed by Congress concerning veteran training, and on the general task ahead for the colleges in meeting the needs of the returning serviceman.

The college program for veterans was based upon two measures passed by the United States Congress. The first of these laws, the Vocational Rehabilitation Training Act, was passed on March 24, 1943. This measure, more commonly known as Public Law Number 16, provided for instruction not to exceed four years on the trade school or college level for disabled veterans. The second law, the Serviceman's Readjustment Act, more popularly known as the G. I. Bill of Rights or Public Law Number 346, was passed on June 22, 1944. This law provided training for any veteran, whether disabled or not, for twelve months in addition to time actually served providing said veteran was under twenty-five years of age at the time of induction. A refresher course of one year was provided for those over twenty-five years of age.

The two measures were modified by Public Law Number 268, enacted on December 28, 1945. This law removed all age restrictions on veteran trainees and allowed increases in the monthly allowances for single veterans from \$50 a month to \$65, and a boost from \$65 to \$90 for married veterans. These acts form the legislative basis for the veteran program.

In the fall of 1944, the faculty approved a program for admitting veterans who had completed only the first two years of high school. It was, hence, agreed to offer refresher work of a sub-collegiate character, or of a preparatory nature, for those who had not completed their full high school requirements. The school gave, in residence, work necessary to bring a veteran's record up to where he was permitted to enter the regular college program. A Veterans' Advisory Committee was selected in the spring of 1945, under the chairmanship of Professor S. H. Lloyd. This committee functioned effectively in advising and guiding the veteran in his many school problems.

The Veteran Training Program opened at the school in the fall of 1944, with eleven ex-servicemen. It was a year, however, before there was an appreciable increase, and, by the fall of 1945, a total of ninety had matriculated. The coming of V-J Day and the wholesale discharges from the service in the following months brought the real inauguration of veteran training. In the spring semester of 1946, a total of 584 were training at the school under the two public laws. But this was only a beginning, since during the following summer session of 1946, the number of veteran trainees was well over seven hundred, and they comprised approximately eighty-five per cent of the

total number of students. With an anticipated enrollment of two thousand or more in the fall semester of 1946, an estimated sixteen hundred or more were expected to be veterans.

The enormous increase in veteran trainees from only ninety in the fall semester of 1945, to 584 for the spring term of 1946, resulted in the establishment of a Guidance Center on the campus. The Center was opened on January 28, 1946, with offices on the first floor of Parker Hall. The Center served as a co-ordinating agency aiding the veteran in securing from the St. Louis regional office his subsistence allotments and other benefit payments. The Center at the school also served to take some of the advisement load from the over-burdened St. Louis regional office. The other basic objective of the Guidance Center was to bring the advisement or counseling directly to the campus for the benefit of the trainee. The Center also offered free guidance service to any veteran in this region who requested this service, thereby, obviating the necessity of the veteran going to St. Louis. The Veteran's Service Committee of the school continued to serve in close cooperation with the officer of the Guidance Center in the work of advisement and the administering of various types of interest and aptitude tests.

The school administration adopted the policy of giving the veteran the same treatment, recognition, and subject matter as that accorded the regular students. A surprising, but somewhat happy result for the school administration and the faculty, was the fact that practically all of the trainees entered the regular four-year degree program. So few entered the short courses that the faculty in August, 1946, abolished practically all of the two-year training subjects.

As in the years following the First World War, Missouri School of Mines again dedicated its facilities to the service of those who so heroically gave their all to preserve the American system of democracy and to achieve total victory. The institution was prepared and its facilities were expanded to train these servicemen for a more useful and productive life. With a sympathetic Dean and a cooperative faculty, the school was thoroughly equipped to render the greatest service in its entire history in the training of veterans in the immediate years ahead.

Because of their common interests, problems, and influence, an organization designated as the Campus Veterans' Association, came into existence during the fall semester of 1944. The purpose of the organization was to give the returned veteran the opportunity of comradeship, and to promote a spirit of mutual assistance both in their contacts with one another and in their relations to school and community. There were only eleven veterans enrolled in school when the association was formed but after January, 1946, when their number exceeded five hundred, it became one of the most active and powerful organizations on the campus.

When in January, 1946, the number of veteran trainees surpassed five hundred, the problem of housing in Rolla became acute. The Campus Veterans' Association immediately acted to devise means of alleviating the housing shortage. The association's activities included sending a committee to confer with President Middlebush on housing units to be furnished by the University, sending a representative to confer with officials of the Federal Public Housing Administration at Chicago, and in such local activities as speeches before the Chamber of Commerce on the gravity of the situation, and influencing the Rolla City Council to relax zoning restrictions for the duration of the emergency. This veterans' association bids fair to become the most influential student organization on the campus.

On November 1, 1941, the practice was initiated of holding Parents' Day in conjunction with Engineers' Day. This experiment proved a remarkable success, with over five hundred guests observing the engineering exhibits and attending the parents' activities. Regular classes were held during the morning in order that parents might see their boys at work, and be given an opportunity of meeting the faculty members. The exhibits were judged by many as the best in the history of this celebration. This first experiment was so successful that Parents' Day and Engineers' Day have remained combined since 1941.

The war period from 1941 until 1945, temporarily reduced some of the extra-curricular student activities. The activity that was perhaps most difficult for students to relinquish was the traditional Saint Patrick's celebration. Nevertheless, for financial and other reasons this renowned student affair was abandoned for the duration of the war, following the 1942 festivities. With the coming of V-J Day in August, 1945, and the subsequent increasing enrollment, the annual visit of Saint Patrick to the School of Mines was renewed. The first postwar traditional celebration was held in March, 1946.

The student publication, MISSOURI MINER, experienced financial difficulties by the spring of 1943, and for some time there was a possibility that it might be forced to discontinue. The situation was relieved, when in June, 1943, the publication became a part of the ROLLA NEW ERA for the duration. This local Rolla paper published a special section, every Tuesday, devoted to School of Mines affairs and activities. Since the close of the war the MINER is again published by the MINER Board.

The ROLLAMO likewise suffered because of inadequate finances, resulting from a limited enrollment. One year the service fraternity, Blue Key, published the school annual. These war-time handicaps have since been removed, and the 1946 ROLLAMO compares favorably with that of any previous school annual.

The social, honorary, and service fraternities have continued to serve their student members and bring honor to the school. On December 10, 1944, the Alpha Phi Chapter of Gamma Delta, International Association of Lutheran Students, was installed on the campus. The association claimed a total of sixteen members by the spring of 1946.

The Wesley Foundation Student Council, a Methodist student organization, was founded on the campus in September, 1945. Membership is not limited to Methodist students, but is open to all students. It seeks to promote good fellowship and create higher standards of ideals among the students. The foundation listed a membership of twenty-two students in the spring of 1946, and has served a worthy purpose.

The present Missouri School of Mines Glee Club was organized in the fall of 1942. Since 1943, under the direction of D. H. Erkleitman, the club has performed at assemblies, commencements, and other school functions, and has won the praise of the faculty, and the acclaim of all friends of the school.

The highlight of athletic developments since 1941, has been the enlargement of the intramural sports program. The war years with the forced curtailment of intercollegiate competition, brought an increased emphasis upon intramural activity. This consists of competition in practically all phases of sports among the social fraternities and other student organizations. An intramural league exists with these school organizations as members, and during the 1945-46 school year these members competed in football, basketball, track, volleyball, handball, rifle marksmanship, wrestling, swimming, and boxing. In the summer of 1946, fencing became an intramural sport, and the M.S.M. Fencing Club was chartered in August of this year. This intramural activity is one of the most significant extra-curricular programs at the School of Mines, and Coaches Gale Bullman and Dwight Hafeli are to be commended for their untiring efforts in initiating the program.

Intercollegiate football was suspended in 1944, for one year, and in the fall of 1945, Missouri Intercollegiate Athletic Association competition was renewed. The school prospects for the future appear excellent with the increasing enrollment, and winning football, basketball, and track teams are a distinct possibility in the years ahead.

One of the most recent and perhaps most significant progressive curricular policies adopted by the Wilson Administration has been the integration of the humanistic studies within a single division. The new division is designated the Department of Humanities and Social Studies. This constructive change represents an attempt to achieve a greater degree of co-ordination between the fields of English, modern

languages, and the social studies and the fields of professional engineering. It is anticipated that a more complete training in these liberal subjects, so essential to the professional engineer of the 20th Century, can be attained.

This revision conforms to recommendations by the Committee on Engineering Schools of the American Society for Engineering Education. It is likewise recommended by various educators as elaborated through articles in the JOURNAL of ENGINEERING EDUCATION.

This curricular reorganization plan was officially adopted by the Board of Curators on August 30, 1946. To supervise and head this significant department, the Board selected Professor Samuel H. Lloyd, Jr., who previously served as chairman of the Department of Economics and History.

In order to give the reader some conception of the leaders directing the work of the various departments of instruction, the present departmental chairmen have been included:

Ceramic Engineering.....	Dr. Paul G. Herold
Chemical Engineering.....	Dr. Walter T. Schrenk
Civil Engineering.....	Joe B. Butler
Electrical Engineering.....	Floyd H. Frame
Engineering Drawing.....	Clifford H. Black
Geology and Mineralogy.....	Dr. Oliver R. Grawe
Humanities and Social Studies.....	Samuel H. Lloyd, Jr.
Mathematics.....	Rolfe M. Rankin
Mechanical Engineering.....	Dr. Aaron J. Miles
Mechanics.....	Rex Z. Williams
Metallurgical Engineering and Ore Dressing.....	Dr. Albert W. Schlechten
Military Science and Tactics.....	Major Edward C. Richardson
Mining Engineering.....	Dr. J. Donald Forrester
Physics.....	Dr. Leon Woodman

The genuine success attained by Missouri School of Mines during the past five years may be attributed to the courage, administrative ability, and inspirational zeal of its present Dean, Curtis Laws Wilson. Dean Wilson has not only taken an active part in civic, religious, and community affairs of Rolla, but has also won statewide acclaim as a public speaker. His administration has won the full support of the university administration at Columbia. Dean Wilson without doubt, will rank as one of the greatest administrative heads in the history of the school.

A history of the Missouri School of Mines would be incomplete without recognition of the interest, efforts, and loyalty displayed by President Frederick A. Middlebush, of the University of Missouri, of which the School of Mines is a division. President Middlebush has at-

tained a distinguished record in the administration of the affairs of the University of Missouri, since his inauguration as President in 1935.

Under the leadership of President Middlebush and the direct supervision of Dean Wilson, the School of Mines is rendering, and will continue to render, a service that will eclipse the noble achievements of the past.

BACHELOR DEGREES GRANTED 1942-1946

<i>Year</i>	<i>Mining</i>	<i>Met.</i>	<i>Civil</i>	<i>Mech.</i>	<i>Elect.</i>	<i>Chem.</i>	<i>Ceramic</i>	<i>Science</i>	<i>Total</i>
1942	62	26	21	37	27	35	6	3	217
1943	40	23	26	43	20	25	12	2	191
1944	13	27	11	31	30	28	0	1	141
1945	4	5	2	5	7	11	1	..	35
1946	11	5	7	2	5	8	4	3	45
Totals..	130	86	67	118	89	107	23	9	629

ENROLLMENT BY CURRICULA 1941-1946

<i>Year</i>	<i>Min- ing</i>	<i>Met.</i>	<i>Civil</i>	<i>Mech.</i>	<i>Elect.</i>	<i>Chem.</i>	<i>Cera- mic.</i>	<i>Gen.</i>	<i>Sci.</i>	<i>Unc.</i>	<i>Total</i>
1941-42	149	110	82	164	98	125	29	94	7	28	886
1942-43	124	112	95	187	112	146	23	124	7	28	958
1943-44	57	64	58	107	68	100	11	28	6	A.S.T.P. 30	527 556
											1083
1944-45	26	23	31	44	37	52	8	54	2	31	1308
1945-46	121	64	111	143	126	102	21	151	16	41	2905

¹Including one duplicate

²Including four duplicates

ENROLLMENT BY CLASSES 1941-1946

<i>Year</i>	<i>Freshmen</i>	<i>Sopho- mores</i>	<i>Juniors</i>	<i>Seniors</i>	<i>Graduates</i>	<i>Unclasi- fied</i>	<i>Totals</i>
1941-42	221	225	185	219	11	25	886
1942-43	323	175	213	211	13	25	958
1943-44	120	60	101	213	7	27	
					A.S.T.P.	556	1084
1944-45	143	33	51	48	2	31	308
1945-46	496	126	116	89	26	52	905

TOTAL BACHELOR OF SCIENCE DEGREES GRANTED BY MISSOURI SCHOOL OF MINES AND METALLURGY

1874 - 1946

1874-1888.....	44
1888-1907.....	192
1907-1920.....	403
1920-1941.....	1,792
1941-1946.....	629

Total.....3,060

PERCENTAGE OF STUDENTS WHO LIVED IN MISSOURI
1924 - 1945

<i>Year</i>	<i>Total Enrollment</i>	<i>Live in Missouri</i>	<i>Per Cent</i>
1924-25	399	212	53
1925-26	408	286	58
1926-27	446	272	61
1927-28	505	288	57
1928-29	536	307	57
1929-30	552	341	62
1930-31	635	408	64
1931-32	679	464	68
1932-33	529	384	72.5
1933-34	384	291	76
1934-35	415	328	79
1935-36	446	346	77
1936-37	531	414	78
1937-38	707	537	76
1938-39	809	582	72
1939-40	895	640	72
1940-41	931	663	71
1941-42	886	642	72
1942-43	958	725	76
1943-44	Civilian 528	419	79
	A.S.T.P. 556	40	7
Total.....	1084	459	42
1944-45	307	248	81

MASTERS OF SCIENCE DEGREES GRANTED
1942 - 1946

<i>Year</i>	<i>Mining</i>	<i>Met. Eng.</i>	<i>Civil</i>	<i>Mech.</i>	<i>Elect.</i>	<i>Chem.</i>	<i>Ceramic</i>	<i>Science</i>	<i>Total</i>
1942	..	..	..	..	..	2	2	1	5
1943	..	..	..	..	..	..	..	1	1
1944	..	..	..	..	..	..	..	..	0
1945	1	..	..	..	..	..	1	..	2
1946	3	1	..	..	..	..	1	..	5
Totals...4	—	1	..	..	..	2	4	2	13

PROFESSIONAL DEGREES GRANTED
1942 - 1946

<i>Year</i>	<i>Mining</i>	<i>Met. Eng.</i>	<i>Civil</i>	<i>Mech.</i>	<i>Elect.</i>	<i>Chem.</i>	<i>Ceramic</i>	<i>Science</i>	<i>Total</i>
1942	..	..	1	2	..	..	..	..	3
1943	1	..	1	..	..	..	1	..	3
1944	3	..	1	..	1	1	..	..	6
1945	2	..	..	..	..	..	..	..	2
1946	1	1	..	..	..	..	..	..	2
Totals...7	—	1	3	2	1	1	1	..	16

RETROSPECT

The seventy-five year historical record of Missouri School of Mines is a story of glorious achievements that have brought honor and fame to the State of Missouri. The distinguished alumni are serving in responsible positions all over the world. Many of these sons have won international fame for themselves, for their Alma Mater, and for the state.

The many contributions of the institution during the three-quarters century of its existence are so universal and stupendous that they defy description, much less enumeration. An attempt to evaluate the services rendered in terms of pecuniary expenditures made by the people of the state would be equally absurd and a ridiculous farce. Should an attempt be made to evaluate the many contributions on a pecuniary basis one would discover that the alumni have contributed to the total wealth of the nation a sum far beyond all that has been expended for the school's support and maintenance. The institution has performed a real function in the training of the sons and daughters of Missouri in leading a more useful, beneficial, and fruitful life. Such a service cannot be measured in a physical sense.

The seventy-five years of progress is the story of the evolution of the modern School of Mines with its present campus, modern plant facilities, and an eminent faculty, from the small one-building institution with a faculty of three members and a limited enrollment of twenty-eight. It is a record of increasing service, of a broadening curricula, and of development of modern standards of scholarship and research.

For about a quarter of a century growth was limited and the school experienced many hardships, but after these early difficulties, the institution began a remarkable period of development that made it one of the greatest Schools of Mines and Metallurgy in the entire country. The institution today stands as a symbol of the unselfish devotion, vision, and intellectual foresight, of those who have so courageously served it in the past.

The history of Missouri School of Mines and Metallurgy has formed a significant phase in the development of the state. Its problems, crises, growth, and expansion have played an integral part in the historical progress of this great commonwealth. As this institution prepares for a greater and nobler future, it is enriched by a past record of achievement, success, and attainment that will be outstanding as a source of inspiration and as a guiding tradition for ages to come.

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